THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 27 NEW YORK, DECEMBER, 1929 No. 12

Gold Plating with Automatic Conveyor System

A Razor Plant Reduces Costs Materially and Improves Its Product by Means of a Full Automatic Installation for Gold Deposition

A SHORT time ago the Gem Razor Company, Brooklyn, N. Y., found it incumbent upon them to supply a demand for gold plated razors which required production to be speeded up to no less than 50,000 per day. This meant an enormous increase over the output that had been maintained previously, when gold plated razors made up only a small proportion of the company's already large output. It meant making about 13,000 parts, or 6,500 complete razors, every hour. Still tanks had always been employed for gold plating, but it was obvious that while the still tanks had been sufficient for a small production, this could not be continued if the razors were to be produced economically, profitably. It became obvious, according to the company's manufacturing officials, that some mechanical means of producing gold plated razors would have to be installed. After a considerable amount of calculation and effort to decide upon some suitable method of getting the desired heavy production, the problem was presented to the Hanson-Van Winkle-Munning Company, manufacturers of electroplating apparatus, mechanical conveyors for electroplating, etc. In collaboration with the officials of the Gem Company the engineers of the Hanson-Van Winkle-Munning organization decided upon the installation of a mechanical conveyor plating tank specially designed to meet the Gem Company's needs, and capable of producing a gold plate upon the razor parts at the high rate of speed required.

Installation of Conveyor

The installation designed was immediately built and installed in the Gem plant. Officials of the razor company have remarked upon the speed with which the machinery was put into their plant. Within five weeks after the order was placed the installation was operating in the razor factory. After it was properly adjusted to meet the details of the work for which it had been designed, the conveyor was placed in full operation on a regular scale, and it produced the desired 13,000 parts per hour—equal to 156,000 complete razors in 24 hours—without any difficulty. It was found that the conveyor could be operated by what the officials have termed a "bright young man" entirely lacking in electroplating experience, with an experienced plater to supervise the work at intervals to make certain of complete safety.

The full significance of this fact can be gained from the further statement by an official of the company that the operation of the mechanical plating apparatus actually effected a saving of the labor of at least 100 experienced electroplaters who would have been needed to produce the same number of razors by the old still tank method previously employed. The machine is, in fact, supervised by a man whose major duties are confined to other electro-

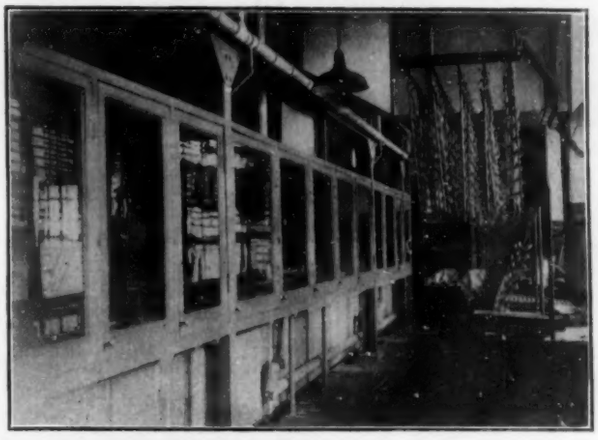

Fig. 1—Side View of the Fully Automatic Gold Plating Installation at the Gem Razor Company Plant

plating operations of the company. It is supplied with work by a young man whose chief duty it is to place the racks on the conveyor arms and remove them afterward. The solutions used in the tank are kept uniform and up to requirements by full laboratory control. Tests are made daily for this purpose. Automatic temperature controls on each of the tank units in the machine do away with the human factor in keeping the solutions which are warm or hot at even temperatures.

Gold Deposits Improved

The installation has, besides bringing production to such a high rate, been instrumental in bringing about several other very desirable changes in the gold plated products of the company. In the first place, the gold deposits are now stated to be very much more uniform and dependable than

Fig. 2—A Bench Where Razor Parts Are Packed for Automatic Plating

those that were applied by the still tank method. Rejections which have been a definite, although not unusually large, factor in the gold plating costs, have been cut down to a practically negligible number. Finally, the space occupied by the new machine is so much smaller than the

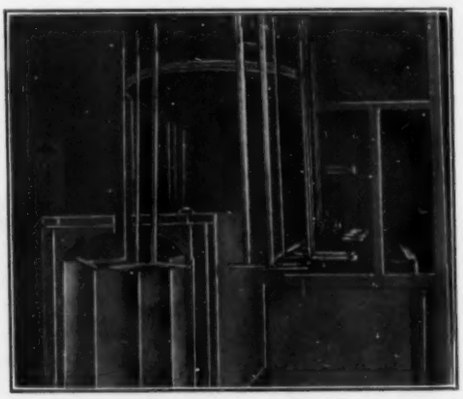

Fig. 3—The End of the Conveyor, where the Parts Are Started Through the Plating Process, and (lower left) Where They Re-appear Fully Plated and Dry

area that would have been taken up to get the same production by the still tank method that the company makes a very material saving, as it should be borne in mind that space in a plant located in a large city is no inconsiderable factor in the cost of operation of the plant.

Having covered the reasons for the installation and its ultimate success and beneficial effect on the company's business, a full description of the automatic conveyer installation will give a complete view of the Gem Company's solution of its gold plating problem.

Design of Conveyor

The installation is similar in design and operation to many others that have been erected in plants where heavy production of plated or galvanized products makes such machinery necessary and desirable. It consists of a series of tanks placed in the form of a long, narrow oval and a conveyor system running directly above these tanks, carrying the work from one tank to the next. The tanks in the series contain the various rinses, dips and plating solutions into which the work must be immersed to get the desired deposit or coating. In the Gem installation there are eleven tanks besides cold and hot air blowers. These carry the work through to a complete gold plated finish which requires no buffing or polishing—which are ready, in other words, to be assembled, packed and sold when they leave the conveyor. The details as to solutions in the tanks are as follows:

Operations

1—Soap dip to remove dirt and as much grease as possible.
2—Hot water rinse to remove soap.
3—Electric cleaner.
4—Reverse current electric cleaner.
5—Cold water rinse.
6—Electric cyanide dip.
7—Cold water rinse.
8—Gold plating solution.
9—First reclaiming bath, to save excess gold.
10—Second reclaiming bath, ditto.
11—Hot water rinse.
12—Air dryers, first cold then hot.

The parts of the Gem razor are made of yellow brass sheet and rod, on automatic metal working machinery of special design. Each razor consists of a head and a handle. The parts are brought to the plating room immediately after buffing and there they are racked for the conveyor plating apparatus.

Analysis of Operations

An analysis of these operations through which the work is carried automatically by the conveyor shows that the cleaning operations are identical with the best manual practice; that the gold plating operation, which is unusually short, produces a heavy, substantial plate suitable for the product. In regard to the latter operation, officials of the company have stated that an especially heavy gold solution is employed in order to speed up the deposit of gold without sacrificing thickness or adherence. The operations following the immersion in the gold solution speak for themselves. Immediately after the work is withdrawn from the gold solution it is immersed in a bath which removes and retains whatever gold-bearing solution is carried out of the gold tank. A second reclaiming bath makes the process doubly effective, and the company makes a substantial saving in gold. After a hot water rinse which warms the work up for drying, the razor parts pass through two blasts of air, one cold the other hot. This air drying procedure, it is stated, brings the work out without danger of spotting and eliminates the necessity of coloring the gold.

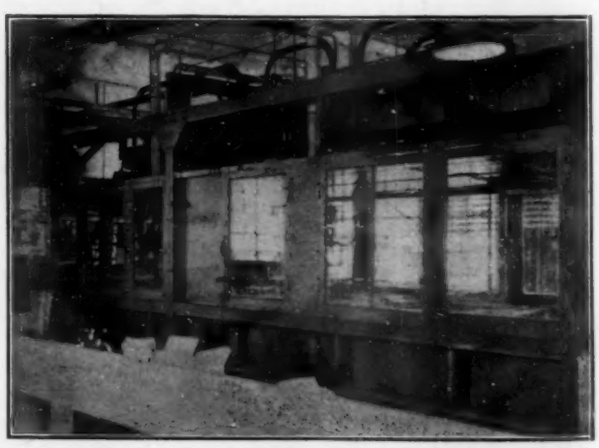

Fig. 4—The Conveyor as Seen from the Side Opposite to That Shown in Fig. 1.

White Metals, Brasses and Bronzes

A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant—Part 3*

By E. PERRY
Consulting Chemist, Oakland, Cal.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Alloying Practice

The making of brass, bronze, and white metal in the brass foundry may be conducted in an economical manner, providing the mixtures are made by analysis and proper care is taken in weighing the metal. The greatest loss is due to careless weighing, this being especially true in the case of expensive metals like tin and bismuth. Another serious loss occurs in melting, due to oxidation and volatilization; consequently the melting point, oxidizing and burning points of the different metals should be known. Tin, copper and lead in the molten state at a high temperature in contact with the air oxidize very quickly, a "dross" forming continually on the surface of the molten metal. This dross must be removed or skimmed off previous to pouring the metal, otherwise it would be impossible to get a sound casting. Although tin, copper and lead oxidize readily at a comparatively low temperature, they are not volatilized below the boiling point, and as the boiling point of these metals is abnormally high there is very little loss in this respect. Conversely, antimony, arsenic, phosphorus and zinc either sublime, volatilize, or burn to oxide at a relatively low temperature, and may be lost entirely during the process of melting if the temperature is too high.

To prevent oxidation, the surface of the metal is usually covered with charcoal or some other reducing or neutral substance to prevent the surface of the molten metal from coming in contact with the air. Atmospheric air contains practically 23 parts of oxygen and 77 parts of nitrogen, by weight. Oxygen is the active element, and it is this gas which attacks the metal, causing a film of oxide or dross to form on the surface. In addition to the loss by oxidation and volatilization there are, and always will be, certain losses due to physical defects in the resultant castings, such as blow-holes, dirt, sand cavities, porous or spongy parts, segregated spots, excessive shrinkage, etc. Hence, it will be seen that there is a wide margin of loss in the brass foundry, and every effort should be made to reduce the loss and keep the cost of production down.

The high melting point metals—nickel, manganese, iron, copper, aluminum, and lead—lose very little in melting as they are practically non-volatile at many degrees above the melting point, volatilization taking place only at and above the boiling point. Tin loses about 0.50 per cent by oxidation in melting, but is not volatilized at 2,000 degrees above its melting point. Antimony, zinc, and bismuth are quite volatile and at a high temperature the two former metals take fire and burn. Arsenic is the most volatile substance used in alloys and is entirely volatilized at a temperature of 841° F.

Physical Properties

All of the different metals possess characteristic properties of their own, and the alloys produced by melting together two or more of the elementary metals often have entirely different properties from that of the metals used to make the alloy; this is particularly true of the melting point which may be lower in the alloy than that of any of the constituent metals. For instance, an alloy consisting of 60 parts of tin (melting point, 451° F.) and 40 parts of lead (melting point, 621° F.) will have a melting point of 334° F. Heat and cold have a great influence on the metals and their alloys; heat causing them to expand, melt, boil, and volatilize, whereas cold causes them to contract or shrink, and if the temperature be low enough they will be extremely brittle. There are tables computed to show the expansion and contraction of the metals, but shrinkage tables never are absolutely correct because the least change in the composition or a difference in the density will cause a variation in the shrinkage. Ordinary soft cast iron will have an average shrinkage of ⅛ inch per foot, while hard iron and semi-steel will have a shrinkage of 3/16 to ¼ inch per foot, according to the carbon content. The patterns for brass castings are made of wood and metal; the principal woods used for patterns are pine, beech, birch, pear, cherry, and mahogany; the metal patterns are made of aluminum, white metal, antimony-lead, brass and cast iron.

At a certain temperature all or nearly all of the metals begin to soften and become "mushy," and at a slightly higher temperature they melt and become liquid. They remain liquid and are quiet with a steady increase or rise of temperature many degrees above their melting point, but a point is finally reached where they begin to boil, and at a slightly higher temperature some of them volatilize or are converted into vapor. If allowed to cool before the volatile point has been reached the metal passes back through the same cycle and again becomes solid on cooling. The temperature at which the liquid metal assumes a pasty or mushy condition is termed the "congealing point," and it is at this temperature where the metal is in a granular form. If the metal is an alloy "segregation" or separation of the different metals will take place while the liquid metal is passing into the granular condition; this is especially true of metals which do not alloy or mix readily, for example lead and copper. By chilling quickly, or pouring into cold molds to shorten the time of granulation, segregation may be prevented, otherwise the lead will settle to the bottom of the mold and the copper come to the top.

*Parts 1 and 2 appeared in the issues of September and November, 1929.

Using Scrap

"Ingot brass" and "ingot bronze" are products of the refiner. Borings, filings, sweepings, dross or skimmings, and ashes, are collected, riddled, washed, and remelted in a reverberatory furnace, using a cover of sal-ammoniac to prevent oxidation. After melting and skimming, the metal is run into ingot molds. As a rule, brass founders use up all of the gates, sprues, etc., but sometimes object to the borings received from the machine shop because usually these contain iron filings, and as a magnetic separator seldom removes all of the iron the result is a hard brass more or less filled with oxide. In order to make cheap brass and bronze it is essential that not only the sprue but also the borings and dross, etc., be used a little at a time, and manipulated in such manner that good castings are obtained.

If the different kinds of borings are kept separated in the machine shop, and are free from iron filings, it is an easy matter to classify them. In the best regulated shops, boxes are provided for the different borings, and the defective castings belonging to this class of material are thrown into these boxes when they are sent to the brass foundry. By keeping the different grades of metal in separate bins and cleaning it in a proper manner it is an easy matter to produce cheap brass of uniform composition.

Of course, brass and bronze made entirely from new metal is the finest possible product, but it is expensive. Consequently if economy is to be considered all of the sprue must be used as fast as made. The percentage of sprue produced varies according to the kind of castings made and may range from 20 to 50 per cent. The sprue is usually covered with sand, and unless the sand be removed by tumbling or with a wire brush previous to remelting, the subsequent "skimmings" will contain all of this useless material and will have to be put through a water-mill to separate the metal. Even after washing a large quantity of metal in the form of oxide is lost, therefore it is better to remove as much sand as possible before remelting.

In the case of borings and sweepings from the machine shop, these should be run through the magnetic separator to remove iron because even a minute quantity of iron will harden the brass and make it difficult to machine. Whenever borings are melted it is necessary that a "flux" be used to oxidize and get rid of the iron. "Ash-metal" containing only skimmings of oxide should not be used in brass mixtures; it should be saved for a quantity and then refined in the following manner:

On the bottom of a plumbago crucible place a layer about one inch thick of lump charcoal; follow with about three inches of "skimmings" or ash-metal, then put in a half-inch layer of charcoal, on top of which sprinkle about 4 ounces (¼ lb.) of potassium bisulphate, then put in three or four inches more of ash-metal. On top of this last layer sprinkle about 4 ounces of iron flux and follow with more ash-metal using enough to bring the charge up to about four inches from the top of the crucible; finally put on a "cover" of common table salt. The salt should be previously dried to get rid of the moisture, otherwise the steam generated might blow some of the material out of the crucible. The salt cover need not be more than three-fourths of an inch thick. When charged, the crucible is placed in the furnace, the furnace covered to prevent escape of the poisonous fumes, and the heat then gradually raised until the mass is in fusion. Before removing from the furnace the contents of the crucible should be stirred with an iron rod to allow the molten metal to settle to the bottom of the crucible. The crucible is now taken out of the furnace and as much as possible of the scoria or slag removed by skimming. The metal is then poured into ingot molds, an iron skimming ladle holding back the thin layer of slag and preventing it from entering the mold. The skimmings from ash-metal are to be thrown away so that they will not become mixed with good material. Some brass founders use sal-ammoniac in place of potassium bisulphate as a reducing flux, and bicarbonate of soda in place of salt for a cover. Ash-metal is best reduced in a reverberatory furnace, using sal-ammoniac and charcoal as a flux, but in the absence of such a furnace the crucible method must be used.

Fluxes

Fluxes are sometimes used to hasten the melting of metals, but more often to get rid of objectionable impurities, as iron, oxide, sand and dirt. The following fluxes are the ones most generally used:

REDUCING FLUX

Acid potassium sulphate, or bisulphate of potash.

For use, place on the bottom of the crucible a thin layer of charcoal, on top of which sprinkle about 1 ounce of the bisulphate. If preferred it may be thrown on top of the melt and stirred in but is not so liable to act on the lower strata of metal. One ounce of flux is sufficient for 100 pounds of new metal and sprue, but more is needed in the case of ash-metal or an all-scrap mix.

STRONG REDUCING FLUX

This mixture acts both as a flux and cover:

13 ounces dry potassium carbonate, 11 ounces dry sodium carbonate; pulverize each separately, then mix thoroughly and keep in an air-tight fruit jar. From 4 to 8 ounces of the flux will be needed for every 100 pounds of metal, in fact any quantity may be used because at a high heat it unites with the silica or sand and forms a sort of glass, which acts as a cover and prevents oxidation.

UNIVERSAL FLUX

1 pound of boric acid mixed with 3 pounds of bicarbonate of soda (baking soda). Common borax is a good flux, but on account of containing water it must be dried before using. Boric acid does not contain water, and as it is more efficient and not expensive it is to be preferred. From 2 to 8 ounces of the flux is sufficient for 100 lbs. of metal. It is not as strong a reducer as the preceding one, but like that flux it unites with the silica to form a glass-like cover. Its chief use is to prevent the loss of zinc in melting.

BICHLORIDE OF MERCURY FLUX

Mercuric chloride or corrosive sublimate is used to make iron combine with copper, zinc, and other metals. It is very poisonous and must be handled with care. Half an ounce or less of the bichloride placed in the bottom of the crucible at the start is sufficient for 100 pounds of metal.

IRON FLUX

This flux, sometimes called "Iron Fiend Flux," is designed to remove iron and acts in an exactly opposite manner to the bichloride flux by throwing out the iron and causing it to unite with the slag. Like the bichloride, it is poisonous due to the cyanide of potassium it contains. The composition of this flux is:

Soda Ash	75.00%
Potassium Cyanide	18.75%
Pulverized Glass (Silica)	6.25%

From 1 to 2 ounces of this flux is generally sufficient to remove the iron from 100 pounds of brass or bronze.

REFINER'S FLUX

Mix thoroughly in an iron mortar or a mixing machine, 1 lb. of black oxide of manganese and 2 lbs. of pulverized glass or ground silica. This flux is used for purifying scrap metal; 3 or 4 ounces of the flux in the bottom of the crucible, per 100 lbs. of metal, is required to cleanse the melt.

BLACK FLUX, FOR VOLATILE METALS

This is a mixture consisting of 1 part of potassium nitrate (saltpetre) and 2 parts of argol (impure potassium bitartrate), fused together and then powdered. A little of the powder, 3 or 4 ounces, thrown on the surface of the molten metal prevents the loss by volatilization of such metals as arsenic, zinc, and antimony. Black flux is a standard article, and it is better to buy it than attempt to make it.

PHOSPHOR-FLUX

In melting brass and bronze with a large percentage of sprue and borings it is often necessary to use a flux which will not only deoxidize the metal but will at the same time impart fluidity and thus prolong the life of the molten metal. Phosphorus is the one element most suitable for such purpose, and may be introduced in the form of phosphor-tin, phosphor-copper, or as ammonium phosphate.

Phosphor-tin acts as a deoxidizer, but has a tendency to harden the copper alloys; furthermore, the phosphorus content is low, and the alloy is expensive. Phosphor-copper contains about 12.50 per cent of phosphorus, is less expensive, and does not harden the copper alloys to any extent. Two ounces of phosphor-copper thrown into 100 lbs. of melted brass or bronze and well stirred previous to pouring off, will clean the metal and make it fluid enough to fill every part of the mold. Two ounces of 12.50 per cent phosphor-copper will raise the phosphorus in the castings only about 0.01 per cent. In white metal, or where the addition of copper is undesirable, the phosphorus may be introduced in the form of ammonium phosphate, a little of the ammonium salt being thrown on the surface of the molten metal from time to time, and stirred with a pine stick. As much of the phosphorus burns up, it is better to add the salt just before pouring.

Covers

The substance thrown on the surface of molten metal to prevent oxidation, or the forming of dross, is generally spoken of as a "cover." A great many brass founders do not use any other cover than the burning coke which they pile on top of the molten metal. Coke and coke dust are good covers but coke contains sulphur, and sulphur produces hard spots in the castings, therefore some attention should be given as to the proper covers to use.

Graphite or plumbago is generally free from sulphur, and makes a good cover but is somewhat expensive;

Wood charcoal is the best carbon cover, and being free from sulphur is to be preferred to all others;

Bone black or animal charcoal also is a good cover, and as it contains a large amount of calcium phosphate it slightly increases the fluidity of the metal.

All of the carbon covers eventually burn up, consequently must be replenished frequently by throwing more of the material on the surface of the molten metal.

Common table salt (sodium chloride) is a favorite cover with most foundrymen, but on account of it containing much moisture the salt should be previously dried or placed in the bottom of the crucible and the water driven off at a gentle heat. At a high heat the salt melts and forms a glass-like slag on top of the metal.

Sodium bicarbonate (common baking soda) makes a good cover.

Dried borax and boric acid, especially the latter, are excellent covers. Like common salt, they melt and form a glass-like slag on top of the melt. Borax and boric acid readily unite with silica, alumina, lime, etc., and carry off such impurities into the slag;

Pulverized glass which is composed almost entirely of silica, and the ordinary floated silica used as a paint pigment, are frequently used as covers where an infusible material is desired;

Plaster of Paris, especially the variety known as "Dental Plaster," is often used as a cover particularly when phosphor-copper is used as a deoxidizer. The dental plaster is placed on the bottom of the crucible at the start, but rises to the top when the metal becomes liquid.

The choice of a proper cover will depend upon the alloy which is being melted; whereas wood charcoal may be used for any of the alloys, better results are often obtained with a cover suited to the requirements of certain alloys high in zinc, lead, etc. The covers to be used in such cases are as follows:

Alloys high in tin—Wood charcoal, bicarbonate of soda, common salt, silica, sal-ammoniac, rye or wheat flour;

Alloys high in zinc—Boric acid, borax, bicarbonate of soda, common salt, wood charcoal, powdered soapstone (talc);

Alloys high in arsenic, bismuth, antimony—Black flux, wood charcoal, common salt, carbonate of soda, silica;

Alloys high in copper—Wood charcoal, bicarbonate of soda, plaster of Paris, silica, powered soapstone;

Alloys high in lead—Wood charcoal, silica, plaster of Paris, soapstone, and rye flour. Boric acid or borax must not be used with high-lead alloys;

Alloys high in phosphorus—Rye flour, corn starch, and bone black.

This series will be continued in an early issue.—Ed.

Soldering Nickel Silver and Steel

Q.—I would like directions for soldering stainless steel to nickel silver with silver solder. Borax as a flux seems useless, I find. Please state the proper flux if you can.

A.—Use powdered boracic acid as a flux. The flux should be applied before heating if possible. A silver solder extensively used by jewelers is composed of 70 per cent silver, 30 per cent copper. Solders for nickel silver are generally made of the material to be soldered, but in such proportion that the melting point is lower. In some cases, silver solder is used for uniting nickel silver articles, and German silver is also used for soldering articles of steel and iron on account of its high melting point and tenacity.

—P. W. Blair.

British Standard Aluminum Specifications

Five new specifications relating to aluminum have recently been issued by the British Engineering Standards Association. Two, numbered 359 and 360, are for 98 per cent aluminum notched bars and ingots and rolling slabs and billets, and 99 per cent aluminum notched bars and ingots, respectively. These deal with the chemical composition of the bars, etc., and the provision of samples for analysis.

The other three specifications are for 7 per cent copper, 12 per cent copper, and zinc-copper aluminum alloy castings, and are numbered 361, 362 and 363, respectively. The chemical compositions are specified, together with requirements relating to chemical testing, dimensions, margins of manufacture, and freedom from defects. Mechanical tests are laid down and provision is made for the supply of test samples.

Copies of these specifications may be obtained, price 2s. 2d. each, post free from the Publications Department, British Engineering Standards Association, 28 Victoria Street, London, S. W. 1, England.

—A. Eyles.

Casting White Bronze

Q.—I am sending you two pieces of a white bronze casting in which you will note that the fracture shows a yellow and brown section. The mixture used in the metal is as follows: 68 per cent copper, 16 per cent nickel, 4 per cent tin, 4 per cent lead, 8 per cent zinc. Can you tell me the cause of the discolored portion?

Can you also send me a good mixture for white bronze to contain about 12½ per cent nickel for casting?

A.—On examination of sample casting we find internal shrinkage; this is the cause of the fracture showing yellow and brown spots. This internal shrinkage is caused by the light section of the casting cooling and drawing from the heavy sections. You will have to arrange your gates so that the gate will be the last to set, or chill the heavy sections so they will set as soon as the light section.

We suggest you place a nail over the boss in the center of casting, using a roofing nail, and place in cope side and change the gate so as to gate, also, in the heavy section. This will, we believe, overcome the difficulty caused by internal shrinkage.

In reference to a good mixture for a white bronze containing 12½ per cent nickel, we suggest you reduce your nickel content to 12½ per cent and increase your zinc content 3½ per cent.

—W. J. Reardon.

Melting and Pouring Nickel-Chrome

Q.—I am faced with the problem of melting down and pouring nickel-chromium alloy. This material is to be handled in large lots—2,000 to 3,000 pounds at a time—and will be in the form of borings. What kind of furnaces are most suitable and what in general is the procedure? I am accustomed to melting nickel but the chromium addition is something new to me. Are any special fluxes required?

A.—The successful melting and pouring of nickel-chromium alloys requires some experience. The pouring temperatures are of the same order required for steel, in the neighborhood of 3,000° F., and it is usually essential that the metal be protected against contamination by carbon and other impurities.

Electric furnaces are most suitable for this work. The high-frequency furnace of the Ajax-Northrup type and the 60-cycle coreless induction furnace recently developed by the Westinghouse Electric and Manufacturing Company have both been used and recommended for the purpose. With either it is possible to produce approximately 400 pounds of molten metal per hour from one furnace.

Clay-graphite crucibles lined with magnesite are used. Fluxes and slags should be avoided, but the addition of silicon (around 0.1 per cent) and manganese (0.3 to 0.6 per cent) will improve the casting properties of the metal. These additions should be made in the form of ferrosilicon and ferromanganese, using the purest alloys obtainble.

—H. M. St. John.

Light Alloys for Aircraft

Aluminum and magnesium are the lightest commercial metals and hence are the most suitable for use in aircraft. These metals are relatively soft and weak in the unalloyed state, and their application is somewhat limited, writes E. H. Dix, Jr., in the November issue of the "S. A. E. Journal," an official publication of the Society of Automotive Engineers

Aluminum sheet of 99.0 per cent purity can be hardened by cold-working so that it possesses sufficient strength for certain applications, such as cowling and gasoline tanks. The addition of 1¼ per cent of manganese increases the strength and hardness. This alloy, in sheet form, has been used extensively for cooking utensils and, because of its corrosion resistance, which is equal to that of commercially pure aluminum, should find useful application in aircraft construction, although apparently it is little known to aircraft manufacturers at present.

There are certain applications in which lightness is the prime consideration, as, for instance, in the case of impeller blades for superchargers; and in such applications the magnesium alloys show the greatest promise.

Reducing Battery Plates

Q.—I would like to have the lastest information on equipment for reducing battery plates. Please furnish names of manufacturers of furnaces and other necessary equipment and also state if any special processes have been developed to insure maximum recovery of metals from battery plates.

Reference to published material on this subject will be appreciated.

A.—Methods for reducing lead battery plates have not been improved recently so far as we know. After crushing, screening and picking to get rid of as much nonmetallic material as possible, the lead is melted down in a large iron-pot furnace, skimmed free from dross with a perforated ladle, and poured into marketable shapes.

The furnace employed is commonly home made, since iron-pot furnaces made for foundry purposes are usually too small for economical smelting use. A series of articles by Edmund R. Thews, which appeared in The Metal Industry, Vol. 26, 1928, pp. 394, 472 and 513, contains much useful information on the general subject of white-metal recovery.

The following are some manufacturing and engineering concerns which advertise furnaces for white-metal melting: Aluminum Foundry Equipment Company, 318 Plymouth Building, Cleveland, Ohio; The Anthony Company, 140 West Avenue, Long Island City, New York; Monarch Engineering Company, Baltimore, Maryland.

—H. M. St. John.

Recovery of Waste from Tin-base Babbitting Operation

Saving Skimmings, Dross, Gates, Etc., of Tin Base Alloys

By P. J. POTTER

Metallurgist, Federal Mogul Corporation, Detroit, Mich.

A PAPER READ AT THE FALL MEETING, INSTITUTE OF METALS DIVISION, CLEVELAND, OHIO, SEPTEMBER, 1929.

PRACTICALLY all tin-base babbitt metals used in engine bearings are made to customers' specifications, which are many and varied. The copper ranges from 3 to 8 per cent and the antimony from 4 to 13 per cent; generally, the babbitt with lower copper content will contain from 4 to 8 per cent antimony and that with higher copper will have from 7 to 13 per cent antimony. The allowable lead content varies from 0.20 to 2.00 per cent. If a solder is used as a bonding material instead of tin, the resulting material in the finished bearing will have a higher lead content, but it would not be enough to bring the lead above specificational limits. Impurities such as iron, arsenic and bismuth should be determined in the tin before using to insure a uniform and high-grade product. These points must be considered when segregating and grading the waste that comes from the finishing operations on lined bearings.

Classification of Scrap

Because of the extremely rigid nature of most of the specifications for bearing linings it is necessary to use the purest of materials as a base for all compositions. The problem of handling secondary metals is confined almost entirely to the recovery of drosses, spills and turnings incident to the manufacturing operations. As a matter of convenience the waste or scrap may be divided into 10 grades, as follows:

1. Tin from pots where tinning operation is carried out.
2. Tin and babbitt spatters from babbitting operation.
3. Tin skimmings combined with burned zinc chloride.
4. Borings and reamings.
5. Gates from die-cast bushings and bearings.
6. Drosses from die-cast pots, babbitt foundry pots, and pots in babbitting room.
7. Babbitt with small amount of bronze from machining operations.
8. Babbitt and bronze borings.
9. Scrap bronze-back babbitt-lined bearings.
10. Scrap die-cast bearings and bushings.

A few of these grades of salvaged material have compositions that make it possible to determine beforehand where they may be used to greatest advantage; a few may be used after a simple melting followed by analysis, while others require sweating or smelting followed by an extra cleaning operation to bring the finished ingot to the necessary high degree of purity.

Methods of Handling Scrap Listed

1. Since the tin used in the tinning operation dissolves an appreciable amount of copper and zinc from the bearings being tinned, it becomes necessary to remove the impure tin periodically and replace it by pure metal. The metal removed from the pots is agitated with steam for the purpose of drossing off the zinc, and the remaining clean tin-copper alloy is used in babbitt mixtures where specificational limits permit of its incorporation. The drosses from this purification are smelted as in grade 6.

2. In connection with tinning and babbiting operations there are always some spatters and spills of high metallic content. This class of material is swept from around the tin and babbitt kettles and is sweated in an oil-fired reverberatory furnace at a moderately low temperature. The resulting metal is collected in a receiving pot and the traces of zinc are removed as in grade 1. It is then ready for use in babbitt mixtures. The residue from the sweating operation is in the form of dross and is reduced to metal by the smelting process (see below).

3. The skimmings from the kettles are always contaminated with fused tinning flux; they are sweated in a reverberatory furnace and the resulting metal and dross are treated as above.

4. The turnings, punchings and broachings that are absolutely clean, free from iron, steel, bronze or other contaminations, are returned to the babbitt department and melted in a large kettle. The melt is freed from oxides, iron and non-metallic inclusions by treating with sulfur and rosin and the accompanying drosses are reserved for smelting. The cleaned melt is immediately analyzed and 50 per cent or more new metal is added in the correct proportions to bring the whole quantity to the desired specification.

It is usually unnecessary to classify the turnings and chips before treating as described, as the heavy dilution with 50 per cent or more new metal will take care of specification requirements in nearly all instances.

5. Gates and scrap from the die-casting operations are returned to the babbitt department and treated exactly as turnings and chips from lined bearings.

6. Drosses from all kettles and from the sweating furnace are mixed with coal or any other good reducing agent and reduced to metal in a smelting reverberatory. The metal from this furnace is tapped into a large receiving kettle and is refined with steam sulfur and rosin according to the nature of the individual charge. The slags formed during smelting are usually low in metal and are discarded. They are, however carefully assayed and when necessary are returned to the furnace for additional reduction.

7. In some finishing operations it is impossible to remove babbitt without cutting some bronze. Such material is sweated at a low temperature, so as to keep as much bronze as possible in the residue. The resulting babbitt will be rather high in copper and will contain some zinc and lead. The zinc is removed by refining as in paragraph 1 and the lead is reduced by dilution. The residue from the sweating operation is absorbed by the bronze foundry and the drosses from refining are added to other drosses for smelting.

8. From various finishing operations there will always accumulate some mixed bronze and babbitt chips and turnings. As the babbitt particles are in the main larger than the bronze, a separation by double screening is fairly effective. The coarse screen, 6 mesh, removes the heavy babbitt, which is added to class 7. The second screen used is 12 mesh, and the particles held upon it are sweated separately. The resulting metal, after refining for removal of zinc, must be strongly diluted with new metal, as its copper content is high. The remainder of this class and of that which passes the second screen is absorbed by the bronze foundry or sold as occasion or market may determine.

9. Scrap bronze-back babbitt-lined bearings are sweated to remove the babbitt. The babbitt obtained is refined and cleaned, then pigged and used where specification permits. The residue bronze is returned to the bronze foundry.

10. See Paragraph 5.

Cups of the Renaissance

This Is the Fourth of a Series of Articles on Drinking Vessels of Olden Times

By A. F. SAUNDERS
Designer, Benedict Manufacturing Company

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE Renaissance or as the Italians called it, "The Rinascimento" marked the beginning of a great and far-reaching movement which in time completely displaced the ideals and intellectual habits of the Middle Ages in favor of the new ideals and mental processes on which modern learning and civilization are founded, and it revolutionized European art in its every branch.

Originating in Italy at the beginning of the fifteenth century the Renaissance gradually brought about a revival of classical learning and emancipation of art from ecclesiastical control. The plastic arts took on a new direction, opening up broader fields of artistic activity and new sources of inspiration to the designer and it is safe to say that in no branch of art was this new impetus felt more than in that of the goldsmith. At no time before or since has there been such an extraordinarily prolific production of beautiful objects both for use and adornment as were produced during the sixteenth and seventeenth centuries and this fact applies particularly to the artistic genius of the workers in the precious metals. Ingenious in conception, choice in materials, lavish in ornamentation, and expert in execution, it can be truthfully said that the fine work of the master minds of this outstanding period of artistic development has never been surpassed.

In its broadest sense the term Renaissance might be said to cover the entire field of decorative art in Europe from the end of the fourteenth century to the beginning of the eighteenth century, so for convenience's sake, it is divided into three periods of development, approximating the following dates. The Early Renaissance: or Quattrocento, 1400 to 1500. The Middle Renaissance: or Cinquecento, 1500 to 1560, and the late Renaissance or Baroque, 1560 to 1700.

The Renaissance was a period during which special attention was bestowed upon various forms of drinking vessels for it was a time when drinking customs were invested with more or less ceremony and such eminent masters as Benvenuto Cellini, Polidaro Caravoggio, Hans Holbein, Wenzel and Albrecht Jamnitzer, Jacob Frolich and others of their rank did not consider the creation of a fine tankard or goblet beneath the dignity of their art, and many of the choicest specimens of their artistic and skillful craftsmanship have been preserved to us in the form of ceremonial and presentation cups.

Such vessels were made in a variety of forms and combinations of materials, for the old goldsmith had quite a penchant for mounting in the precious metals various products of nature from both land and sea, many of which owing to the limited intercourse with distant countries were still considered rare, while others though obtained nearer home, lent themselves, on account of their shape, to the purpose of a drinking vessel, cocoanut shells, beautifully carved, the shell of the ostrich egg, Nautilus shells, the horn of that strange marine mammal the Narwhal, inlays of Mother of Pearl, cameos, precious and semi-precious stones, rich enamels, pottery and glass are among the many materials oft times combined in the most ingenious manner with mountings of gold and silver.

Surely the banqueting halls of the merchant princes and numerous trade guilds and other associations which

PLATE 1

Fig. 1. Nautilus cup, mounted in gold, 16th Century. Fig. 2. Silver gilt and enamel beaker, Austrian, 16th Century. Fig. 3. Silver and enamel beaker, Italian, 16th Century. Fig. 4. Standing beaker of silver gilt, German, 16th Century. Fig. 5. Silver gilt tankard, English, early 17th Century.

abounded in those picturesque times must have presented a brave and colorful appearance when decked forth, not only with the ordinary standing cups and mugs which served the "business in hand" but also with prize cups and other ornamental drinking vessels of elaborate and fantastic design. The beaker, goblet and tankard were the most popular forms of drinking vessels in general use during the Renaissance and all three types were developed to a very high degree of artistic excellence.

The Beaker

The first of these three vessels, the beaker, is one of the oldest of cup forms. Its name being derived from the Greek "Bika." The shape of this cup indicates that its earliest form was suggested by the end of a horn, the recognized drinking cup of the ancient Dane and the Saxon.

The simplest type of beaker was a perfectly plain tumbler shaped cup hammered out of a flat sheet of silver, to be followed by beakers often richly ornamented with foliage, fruit and birds or with interlacings and strap work. Beakers of late Gothic times were mostly mounted

PLATE 2

Fig. 6. Goblet of carved cocoanut mounted in silver, 17th Century. Fig. 7. The famous Seymour Cup, by Holbein, 16th Century. Fig. 8. Silver gilt cup, English, early 17th Century. Fig. 9. Steeple cup of silver, English, early 17th Century.

on feet usually in the form of dogs, lions, birds or human heads. They were also fitted with covers of pyramidal shape surmounted with some cognizance or object emblematical of the owner of a precious stone that served as a talisman.

Beakers were very popular in Germany and the Scandinavian countries from the 16th to the 18th century. They were even more widely used in Holland where, after the Reformation (1579) the beaker superceded completely the medieval chalice as a sacramental cup in the church.

The two fine old beakers on Plate 1 represent two distinct types of this form of drinking cup. The elaborate silver-gilt cup shown as Fig. 2 is known as the "Werdenberg" beaker, its design, executed in silver gilt and enamels, follows the style of that transitional period between late Gothic and Early Renaissance though the cup was made at a later time, (probably early in the 16th Century).

The spirally ribbed body of the cup is enameled both inside and outside and is further adorned with a delicately chased wreath midway the body. The base of the cup rests upon lions which hold in their claws the arms of the Werdenberg family. The cover ribbed to match the body of the cup is encircled by a richly chased border containing fifteen little figures of angels supporting an equal number of escutcheons. The cover itself is surmounted by a lion holding a shield.

The beautiful old Italian covered beaker shown as Fig. 3, is another example of sixteenth century master craftsmanship. The cup is of gold, of simpler tumbler shape and decorated in champleve enamel, the earliest known method of enameling and developed to a very high standard of artistic perfection during the Middle Renaissance.

The Nuremberg beaker made in 1575 (Fig. 4) is one of the best examples extant of silversmiths work in pure German Renaissance. This cup differs from the usual beaker cup in that it is mounted on a high stem and foot making it in truth a goblet. The decorative features in repousse consists of fruit, shells, flowers and the heads of human figures interwoven with strapwork, a characteristic design motif of the period. The base and cover of the cup are chased to match the body decoration and the cover is surmounted by a warrior in full armor holding his shield and lance.

Beaker cups were introduced into England and Scotland by the Dutch Traders early in the 16th Century but this form of cup never became very popular with the English as they favored the goblet or stemmed cup and later on the tankard.

The Goblet

The goblet form of cup is perhaps the most pleasing shape of drinking vessel ever conceived by man. Its shape and general proportions have descended to us from the ancient Greek "Kylix," the most important and beautiful cup form developed by the Athenian potters.

The great State Cups were usually of goblet form and always fitted with covers. These cups were among the most important and elaborate articles made by the goldsmith of the day and they were made in great variety and wealth of materials and some of these goblets were most unique. Fig. 6 shows a goblet, the body of which is a handsomely carved cocoanut shell mounted in silver elaborately chased.

The so called Seymour cup (Fig. 7) made by the younger Hans Holbein about 1535-1536 and now kept by the Bodelicianci Library in Oxford, England, is another example of the richest beauty of outline, decorative composition and magnificance of construction so characteristic of the fine work of the goldsmiths of the Renaissance.

This great goblet cup was made by the direction of Henry VIII of England for his third wife Jane Seymour who died in 1537. The foot of this magnificent cup rises lightly and gracefully in three sections, ornamented with wreaths, festoons, cherubs, heads, masks and colored stones surrounded by dolphins, the emblem of the Renaissance, decorated with drooping pearls, which break through tendrills and festoon-like flower fads.

The body of the cup is covered with embossed work of the richest order and further embellished with settings of gems and medallions of Roman Emporers, warriors and women. The high top of the cover or lid is decorated with mermaids making music on flower stems and is surmounted by a pair of cupids holding the coat of arms with the royal crown. From the base upon which the dancing cupids are standing flower-like pearls are suspended.

The masterly use of gold, pearls, precious stone and a half relief of the medallions produces a play of colors and forms which bring forth the highest commendations.

Tankards

These vessels enjoyed great popularity in the beer drinking countries of northern Europe during the 16th, 17th and 18th centuries. Its unsuitability for a wine drinking vessel was against its adoption among the Latins. The first tankards were large wooden vessels banded with iron, in which to carry water. Smaller wooden drinking tankards were also made and used, some of which were mounted in silver with coins set in the flat cover and around the sides of the vessel. The tankard was introduced into England by the Dutch traders early in the 16th century when beer became a popular drink in that country.

The earliest tankards made entirely of silver date back to the time of Queen Elizabeth (1558-1603). Their bodies were made with straight sides tapering a good deal from the bottom upwards. Next came the taller upright and straight sided tankards often beautifully chased, but becoming severely plain during the Puritan times of Cromwell's rule (1649-1660).

The fine old English silver gilt tankard made in 1607 shown as Fig. 5 is an excellent example of the flat hammered work of the time of James I. Its decorative features embrace both flat and repousse chasing and is carried out in the style of decorative treatment characteristic of the Jacobean period. Its greatest charm lies in its pleasing combination of lined and domed work which gives variety and expression to the design generally. The bold handle suggests that weight had to be sustained by reason of "the flowing brim." The doming tool also found a field for its use in the decoration of the lid and circular foot.

A long cherished delusion is that the ends of most tankard handles made after 1660 were fitted with "whistles" for the purpose of calling the pot boy when the pot needed refilling. But these are in reality "blow-holes" placed there to ensure equality between the internal and external pressure of air and, therefore prevent any deformations of the metal during its process of soldering.

About the middle of the 18th century the bodies of most English tankards became bulbous and the covers highly domed and they were fitted with a high molded foot, the decoration usually being of the simplest form. A scrolled thumb piece and a gadroon band around the lip and base seemed to enjoy the greatest vogue.

The fifth and last article of this series will describe the drinking vessels of Colonial and Early American times.

Reclaiming Drosses

Q.—We would very much appreciate your giving us some information that we are desirous of having to check or improve our method of reclaiming white metal drosses and residues. We have our own reverberatory furnaces and are running lead dross, type dross, hard metal drosses and ashes, solder drosses and ashes, babbitt drosses and ashes. The following are average analyses of the material:

Lead dross: 80 per cent to 90 per cent metallics, 75 per cent to 85 per cent lead.

Type dross: 75 per cent metallics, 1 per cent copper, 4 per cent to 8 per cent antimony, 3 per cent tin, 66 per cent lead.

Hard metal drosses and ashes: 79 per cent metallics, 61 per cent lead, 7 per cent tin, 6 per cent antimony, 2 per cent iron, 2 per cent zinc.

Solder dross and ashes: From 57 per cent to 75 per cent metallics, from 16 per cent to 30 per cent tin, from 28 to 35 per cent lead, approximately 2 per cent antimony, ½ per cent copper.

Babbitt dross and ashes: From 65 per cent to 85 per cent metallics, 35 per cent to 50 per cent tin, 10 per cent to 15 per cent antimony, 1 per cent to 4 per cent copper, some tin and aluminum, balance lead.

We would appreciate your telling us what fluxes are best to use in the above material, and the proper quantity of each flux per thousand pounds of material used. What we are trying to do is keep all the tin content we possibly can in the babbitt, solder, hard metal and type metal material. Also, we desire to take the copper from the electrotype and other drosses that are high in copper.

A.—We suggest you make up a flux composed of:

Iron scale	100 lbs.
Lime	50 lbs.
Coal dust	200 lbs.
Silica sand	75 lbs.
Soda ash	15 lbs.
Fluor spar	50 lbs.

Mix this material well and add 25 per cent of this flux. The iron will throw down the tin and lead and flux off with the slag. If the slag shows any tin, increase the iron content. This flux should give you the results desired for all your white metals in reverberatory furnace work. You must have sufficient heat.

—W. J. Reardon.

Brass Casting Practice

Q.—I would like to ask a few questions regarding some trouble I have had of late. I am making some ferrules of 5/16 in. section, 2½ in. diameter, 9 in. long, red brass, as follows: Copper 86.30, lead 3.6, tin 2.7 and zinc 7.2. I have poured at different temperatures, 1900° to 2100° F, and castings have leaked in center and on cope side, which appears spongy. I broke one in two and it showed some copper oxide. We are melting with oil and using crucibles in pit and use borax for flux.

I am having trouble with castings coming with black spots and otherwise dirty color. Would a high lime content in the sand cause this or would too hot sand? We are dusting molds with flour and this condition appears with different pouring temperatures and different sections of metals. Would iron in brass cause this discolor? I might add we buy ingots of the following analysis: Copper 85, lead 4, tin 3, zinc 8 and we add 10 per cent of copper.

A.—We suggest you look at the core for trouble. See if the core is not too hard. Your core should be soft for such thin metal. You state casting leaked in on cope side and appears spongy. This would suggest core trouble and we advise looking to this first. It is rather hard to say just what is the trouble without seeing the casting. However, we feel you will improve your condition by looking to the core.

Black spots and otherwise dirty color: There is no trouble of this kind caused by the sand. The trouble is in the metal ingot. This ingot no doubt contains oxides and iron, which are generally found in such metal. To prove this, make a mixture of the same analysis from new metal and note the results.

—W. J. Reardon.

Pickling Copper Sheets

Q.—Please supply us with any information you may know of relating to the pickling of copper sheets, prior to the operation of lead coating.

If you are not able to refer us to any standard publication, we shall be glad if you would outline to us the processes your technical staff are familiar with.

A.—The term "pickling," is used to denote a method of removing the oxide from the sheets. This oxide is usually caused by an annealing process used to soften the hard sheet for rolling press work.

The pickling bath is sulphuric, 8% free acid, balance water. After leaving the bath the sheets are washed in clean water and dried in sawdust. This must be done thoroughly or the sheets will quickly tarnish.

In preparing commercial copper sheets as received from the manufacturers for coating with lead or tin, only a cleaning operation is necessary. This can be accomplished by passing them through a cyanide solution or by using one of the commercial cleaners advertised in THE METAL INDUSTRY, the one requisite being that the surface of the metal be left free of oil, grease, or tarnished spots.

Coating copper with pure lead by the hot application process is a difficult operation. We know of no commercial production of this material.

—W. J. PETTIS.

Blue on Steel or Brass

Q.—We are writing you to see if we can find a way to obtain a blue chemical stain. The article we are making is something which has been produced in Germany. It has an etching design with the background in blue and the high parts in polished brass.

We have tried to obtain this color by the use of colored lacquer, applying the lacquer while the etching ink was still on the piece. We find, however, that in removing the etching ink the lacquer also comes off. We therefore think a chemical stain of some kind should be applied while the ink is still on. This solution must be cold, otherwise the etching ink will melt.

If you can give us any assistance on this we will greatly appreciate it.

A.—We do not know of any cold solution other than lacquer or varnish that will give a blue color on brass or steel by spraying or by immersion, except the following:

White arsenic	16	oz.
Muriatic acid	1	gal.
Water	½	gal.

Use cold, immerse work until light blue color is obtained. Remove etching ink and lacquer.

However, either of the two following methods will give a blue on both brass or steel:

Caustic soda	5	oz.
White arsenic	5	oz.
Sodium cyanide	1	oz.
Water	1	gal.

Dissolve caustic soda and arsenic in hot water, cool and add the cyanide of soda. Use steel, bronze or carbon anodes at not more than one volt tension. Remove etching ink and lacquer.

Make a saturated solution of sal ammoniac in water. Use steel anodes. Hang a porous cup on the cathode rod and run in iron until a piece of brass or steel hung on the cathode rod produces a bright blue color. Rinse, remove etching ink, dry and lacquer. Use three volts and run cold.

—WALTER FRAINE.

Strip for Alloy Gold

Q.—Could you please give me some advice in regards to an addition to a gold stripping solution to bring my work up much brighter than it does now. I work on gold rings.

I have a stripping solution at present which I made up of 10 ozs. cyanide to one gallon water. I have large quantities of white, yellow and green gold to strip. The white gold strips very satisfactorily, but the yellow and green comes out of the above all porous and eaten; when I make it weaker by taking out some of the solution, the yellow and green strip much better, but when I have to strip the white gold it takes much longer. So I have now made up another one which I use for the white. They all strip bright enough on the outside but not so on the inside of articles, and that is where my trouble lies.

A.—A better electro-strip for your purpose can be made as follows:

Cyanide of sodium	8	oz.
Yellow prussiate potash	4	oz.
Water	1	gal.

Use copper anodes, run cold with reverse current at six volts tension, and if the work is kept in motion while the current is passing it should come out bright.

—WALTER FRAINE.

Brushed Nickel Finish

Q.—We are manufacturers of spinnings made of cold rolled strip steel upon which we put a brushed nickel finish as follows:

Ten minutes of copper and thirty minutes of nickel which is plated upon the copper directly without any intermediate brushing or buffing.

We are having trouble with our material rusting through. It occurred to us that if it were possible to deposit cadmium under the copper, then nickel over both, we would be able to get a finish a good deal more rust resistant than at present. It is essential that the nickel be perfectly smooth as this is part of an expensive item which requires a perfect finish. If this theory is correct, I would appreciate any data that you may have on this subject.

A.—As you do not state the formula of the nickel solution you are using, we cannot tell whether a thirty minute deposit is sufficient to give you the desired protection from rusting. It is also possible that your drying methods may be faulty, allowing moisture to remain too long on the work, especially if oven dried.

However, as neither copper or nickel are rust preventives, a deposit of cadmium previous to copper plating might be helpful in preventing corrosion, although this is disputed, the claim being made that cadmium under nickel loses its protective qualities.

Assuming that your present copper and nickel solutions are satisfactory, you could add the cadmium as a first coat, rinsing, then copper and nickel plating as at present. The cadmium solution may be any one of the licensed processes or may be made up as follows:

Cadmium oxide	2½ to 3½	oz.
Sodium cyanide	5 to 8	oz.
Caustic soda	1½	oz.
Water	1	gal.

Temperature, up to 90° F.; 2 to 2½ volts; 40 amperes per square foot.

—WALTER FRAINE.

New Standards for Buffing Wheels

Summary Report of the General Conference on Full Disc Buffing Wheels, Held in Washington, D. C., October 7, 1929

Simplified Practice Recommendation No. 150-30 Full Disc Buffing Wheels

IN accordance with action taken at a general conference of representatives of manufacturers' distributors, and users of full disc buffing wheels, held in Washington, D. C., on October 7, 1929, the Bureau of Standards of the Department of Commerce submits for the approval of the industry the following list of diameters and ply as standards for stock items:

SIZES (Diameters)	PLY
4 inches	20
5 "	20
6 "	20
7 "	20
8 "	20
11 "	20
13 "	20
14 "	20
17 "	20
18 "	20
20 "	20

This recommendation shall be effective from January 2, 1930, for new production; and January 2, 1931, for clearance of existing stocks of eliminated varieties, and shall be subject to annual revision by a Standing Committee of the industry.

R. M. HUDSON
Assistant Director, Commercial Standards
GEORGE K. BURGESS
Director, Bureau of Standards

History of Project

As a result of suggestions received from the industry, the Division of Simplified Practice of the Bureau of Standards, U. S. Department of Commerce, circularized the manufacturers of buffing wheels regarding the desirability of reducing the existing variety in types, sizes, plies, etc., of full disc buffing wheels.

The replies indicated that manufacturers favored the adoption of a simplified line which would meet all normal requirements.

A preliminary meeting of a representative group of producers was therefore held in New York City on March 7, 1928, and a Simplified Practice Committee was appointed to ascertain by a survey the current practice of the industry. This committee consisted of the following representatives:

B. H. Divine (Chairman of Committee), Divine Brothers Company.

E. Winthrop Hall, F. L. & J. C. Codman Company.

L. W. MacFarland, K. F. Griffiths Buff Company, Inc.

A. N. Sudduth, James H. Rhoades & Company.

Floyd T. Taylor, Hanson-Van Winkle-Munning Company.

Fred W. Worch, The Williamsville Buff Mfg. Company.

A. S. Yohe, The Bias Buff and Wheel Company, Inc.

At a second preliminary conference, held in New York City on May 10, 1929, the following facts were brought out, based on a study and preliminary investigation by Floyd T. Taylor, Vice President, Hanson-Van Winkle-Munning Company.

First—Cloths available for the production of buffs are woven in two standard widths, namely, 40" and 36".

Second—Certain cloths deemed essential for the production of full disc buffs are available in 40" widths only.

A single grade of sheeting now commonly used for full disc buffs is available in a 36" width.

Third—Standardization of certain wheel diameters would reduce the waste in cutting sheeting. Properly selected standard diameters would all cut from 40" sheeting with a minimum average waste.

After discussion of the percentage of waste in cutting each diameter being manufactured, it was proposed that the following diameters be recommended as standard: 4", 5", 6", 7", 8", 11", 14", 17", 20".

It was pointed out that in the larger ranges of sizes the suggested standard diameters would vary by 3" increments, i. e., 1½" increments in radius.

The committee unanimously approved the suggestion that the Division of Simplified Practice of the National Bureau of Standards be asked to present these facts to the users of buffing wheels with a view to enlisting their cooperation in establishing standard diameters.

The Division of Simplified Practice therefore circularized a list of over 600 of the most important users, asking their opinion regarding adoption of the simplified list of diameters as proposed. Replies were received from 124 concerns heartily endorsing the movement. While not actually opposing simplification, 11 users replied that the adoption of the diameters recommended would impose certain hardships in the way of changes in machinery, etc. In addition to the simplification of diameters, a number of users suggested the adoption of the 20 ply buff as standard. The results of this survey among the users, and the recommendations developed by the committee, were used as the basis for discussion at a general conference to which all manufacturers, distributors, and users were invited.

General Conference

At the request of the Simplified Practice Committee of the full disc buffing wheel industry, a general conference of manufacturers, distributors, and users was held at the U. S. Department of Commerce, Washington, D. C., October 7, 1929, under the cooperative auspices of the Division of Simplified Practice, Bureau of Standards.

In opening the conference, W. E. Braithwaite of the Division of Simplified Practice, briefly described the activities and procedure of the Division and the development of the buffing wheel simplification project.

The meeting was then turned over to B. H. Divine, who acted as Chairman. Mr. Divine called attention to the fact that the proposed simplification would eliminate much confusion now caused by the use of a large number of sizes. Each manufacturer, he said, is in reality now making his own standard and each user has in effect established his own standard. This condition has, of course, resulted in the production and use of a wide range of diameters, plies, etc. He spoke of the simplification work which has been accomplished in other industries and declared that in the buffing wheel industry there has been much waste in cutting cloth. He also called attention to the fact that a large volume of the production of full disc buffs are in two thicknesses, namely, 18 ply and 20 ply. He suggested in closing that 20 ply be adopted as standard for full disc buffs.

The chairman called upon Floyd T. Taylor for a de-

tailed report on the investigation carried on by him in determining the percentage of waste in cutting the various diameters for full disc buffs now in use. This study established the fact that the 40-inch sheeting is the most economical width from which to cut buffs. The investigation further revealed that about 60 per cent of demand for full disc buffing wheels is for the 14-inch diameter. Another interesting development in connection with the study made by Mr. Taylor was the fact that more waste resulted in cutting the 12-inch diameter than any other. In view of the fact that use of the diameters recommended by the committee would greatly reduce the wasteful cutting of sheeting out of which buffs are made, a motion was made by Mr. Taylor that the recommended diameters be established as standard sizes for stock items.

A. C. Moore, a representative of the Buick Division of General Motors Corporation, expressed the opinion that the 13" buff should be included as standard, since his company is a large user of this diameter. He suggested that if the conference should include the 13 inch buff in the simplified list, the General Motors Corporation would be willing to make the necessary adjustments to use the other standard sizes.

James G. Couch of Scovill Manufacturing Company suggested that 12 inch and 18 inch buffs be included. He stated that his company was heartily in favor of simplification of buffing wheel diameters, but that since they are large users of both the 12 inch and 18 inch diameters he would strongly recommend the inclusion of these two diameters in the simplified list.

After considerable discussion of these additional sizes, the conference voted to include the 13 inch and 18 inch diameters in the simplified list. It was the sense of the meeting, however, that inclusion of the 12 inch diameter would defeat the purpose of the simplification program, since the cutting of this size results in considerable waste of cloth.

H. G. Griner, of the U. S. Electrical Tool Company, on behalf of the machine manufacturers, expressed the thought that it would be a very good plan to adopt standards and then stick to them, so that the machine tool manufacturers could furnish machines to suit the speed requirements of the various diameters adopted.

It was further recommended by the conference that all diameters other than those included in the simplified list should be considered as "specials."

In view of the fact that the committee found that the variety in sizes or diameters was further complicated by a certain demand for both 18 and 20 ply buffs, the conference adopted the 20 ply as standard. This decision was based largely on the replies received from users, indicating a preference for the 20-ply buff.

Standing Committee

In accordance with the regular procedure of the Division of Simplified Practice, the conference unanimously approved the appointment of a representative Standing Committee for the purpose of enlisting the support of producers, distributors, and users, and to maintain the maximum interest and adherence by keeping the program in line with the best thought and practice of the industry through periodic revision. The personnel of the Standing Committee is to be as follows:

Manufacturers

B. H. Divine (Chairman), Divine Brothers Company, Utica, N. Y.

E. Winthrop Hall, F. L. & J. C. Codman Company, Boston, Mass.

Floyd T. Taylor, Hanson-Van Winkle-Munning Company, Matawan, N. J.

Distributors

Representative of Frederic B. Stevens, Inc., Detroit.

Representative of Crown Rheostat & Supply Company, Chicago Ill.

Users

Representative of Western Electric Company.

Representative of General Motors Corporation.

Representative of Scovill Manufacturing Company.

Manufacturers of Machinery

Representative of U. S. Electrical Tool Company.

Manufacturers of Cloth

Representative of the Cotton-Textile Institute, Inc.

A motion was unanimously adopted that this Standing Committee give consideration to question of kinds of cloth and sewing, and also to such other items as arbor holes and pieced buffs, with the view of working out standards for all types of buffing and polishing wheels, viz., polishing wheels of cloth, leather, and felt.

Effective Date

The recommendation was made effective as of January 2, 1930, for production on the basis of the new standard schedule and January 2, 1931, for clearance of current stocks of sizes and plies not included in the simplified list.

Results

The action of the conference resulted in a reduction from 17 diameters now being produced to 11 standard diameters and from 2 plies to 1 standard ply.

It is expected that this constructive simplification program will result in a very considerable reduction in the wasteful cutting of sheeting out of which buffs are made, and that the savings thus effected in manufacture and stocking will be applicable to all grades of buffs required for various buffing operations.

Realization of the economies inherent in this program is definitely dependent upon the whole-hearted voluntary cooperation of all elements of the industry in the matter of adherence to the recommended schedule of sizes. It is to be hoped that the manufacturers, distributors, and users of full disc buffing wheels will derive such tangible benefits from this simplified practice recommendation that it will become desirable to extend simplification to the whole field of buffing and polishing wheels.

Those in attendance at the conference were:

NAME	REPRESENTING
Burns, Russel H.	E. Reed Burns Manufacturing Company, 27 Jackson St., Brooklyn, N. Y.
Couch, Jas. G.	Scovill Manufacturing Company, Waterbury, Conn.
Divine, Bradford H.	Divine Brothers Company, Utica, N. Y.
Griner, B. H.	U. S. Electrical Tool Company, 111 N. Second St., Philadelphia, Pa.
Kent, R. T.	Divine Brothers Company, Utica, N. Y.
L'Hommedieu, Howard W.	Chas. F. L'Hommedieu & Sons Company, 4521 Ogden Avenue, Chicago, Ill.
Lamm, L. M.	Abrasive Industry, Cleveland, Ohio.
LeLaurin, Harry	Bureau of Ordnance, Naval Gun Factory, Washington, D. C.
MacFarland, L. W.	MacFarland Manufacturing Company, 110 E. 42nd St., New York, N. Y.
Mercier, A. A.	The Cotton Textile Institute, New York.
Moore, A. C.	General Motors Corporation, Flint, Mich.
Taylor, Floyd T.	Hanson-Van Winkle-Munning Company, Matawan, N. J.
Worch, Fred W.	Williamsville Buff Manufacturing Company, Danielson, Conn.
Yohe, A. S.	Bias Buff & Wheel Company, Inc., 430 Communipaw Ave., Jersey City, N. J.
Braithwaite, W. E.	Division of Simplified Practice, Bureau of Standards, Department of Commerce.

Effect of Current Density on the Hardness of Electro-deposited Chromium

Using Various Current Densities, from 1 to 7 Amp./Sq. In., It Is Found That Chromium Has a Maximum Hardness When Plated at About 4 Amp./Sq. In. The Value of This Is Approximately 43 Times as Great as That Obtained at a Normal Plating Current Density of 1 Amp./Sq. In.

By ROBERT J. PIERSOL

Vice-President, U. S. Chromium Corporation, Pittsburgh, Pa.

A PAPER PRESENTED AT THE FIFTY-SIXTH GENERAL MEETING OF THE AMERICAN ELECTRO-CHEMICAL SOCIETY, AT PITTSBURGH, PA., SEPTEMBER 19, 20 AND 21, 1929.

ALTHOUGH hardness is a physical characteristic of any substance, the subject of hardness has been almost entirely omitted in physics. In fact, it is necessary to go into the field of mineralogy to obtain a comprehensive definition of hardness. In this case, hardness is defined as the comparative capacity of a substance to scratch another or to be scratched by another; secondly, the quality of bodies which enables them to resist abrasion of their surfaces. In the first definition the units of hardness are expressed by the Mohs scale. In the second definition the hardness of various substances may be expressed in terms of time necessary for abrasion to a given depth by a standard substance.

The experimental method suggested by this is used in this investigation. The Mohs scale does not lend itself to use where it is desired to express the ratio of hardness of two substances, because there is not a linear relation between the hardness of various standards. For instance, it has been pointed out that the intervals between successive numbers increase rapidly as the hardness number increases, and one step of 9 to 10 is probably as great as from 1 to 9.

Another arbitrary scale of hardness is given by Brinell. In this case, the hardness is defined as the quotient of the pressure by the area of indentation, when a hard steel ball its pressed into a flat surface of the sample to be tested. In this, the hardness of steel, for example, has a direct relation to its tensile strength. Therefore, the Brinell hardness is really a measurement of the tensile strength of a metal, rather than its true abrasive hardness.

Likewise the scleroscope invented by Shore, for the determination of the hardness of metals, consists of an instrument in which a ball rebounds from the surface to be measured. Again this really determines the coefficient of restitution of a metal, rather than the abrasive hardness of a metal.

Probably the instrument best apapted to give the relative scratch hardness is the sclerometer. In this, the crystal to be examined, is placed with one surface exactly horizontal, upon a delicate carriage movable below a vertical rod, which ends in a diamond or hard steel point. The point is attached to an arm of the lever, and a weight is determined which must be placed above, in order that the scratch shall be made upon the given material as the carriage is moved. In this case, the hardness is given in an arbitrary scale of weights necessary to cause scratch on materials of different hardnesses. Its practical limitation is its inability to give a linear scale as to the relative time necessary to cut through samples of various hardnesses.

The literature on the hardness of chromium is exceedingly meager. Phillips[1] has stated that it is not known exactly how hard chromium is, because as yet no instrument has been developed for measuring this hardness. By the use of a "microcharacter" he was able to measure some of the soft modifications of chromium plate, which he found to be considerably harder than the hardest steels. He also notes that it is necessary to back up chromium plating with hard metal, if the article plated is to be put to hard use. In other words, if the impact is great, the steel parts should be carburized or cyanided before chromium plating.

Payne[2] gives the following table of comparative scratch hardness, which gives a certain amount of information as to the hardness of chromium as compared to other metals.

Chromium	2,000
Case hardened steel	1,950
Steel shafting	750
Swedish iron	408

Blum and Hogaboom[3] emphasize the fact that in the case of thin electrodeposited plate, neither the Brinell nor scleroscope measurement means anything, due to the fact that if the thin deposits are adherent to the base metal, the results are certainly influenced by the physical properties of that metal. Also, they emphasize the need of simple methods of determining the hardness or wearing qualities of electrodeposited metals. They suggest that pending the development of reliable methods for measuring the hardness of thin sheets, that it be assumed as an approximation that the hardness of any given metal is proportional to its ultimate tensile strength, which can be measured with relatively thin specimens.

Experimental

It has been known since the early days of electrodeposition that the hardness of the plate varies widely with plating conditions. One of the important variants is the rate of liberation of hydrogen while deposition takes place. Apparently, it is possible to increase hardness by the inclusion of hydrogen. Possibly this corresponds to either carbon hardening or nitrogen hardening. Also it is decidedly similar to hardening by pickling, in which case there is likewise penetration of hydrogen.

In this investigation, the work is limited to the comparative hardness of chromium deposited at different current densities. Current densities of from 1 to 7 amp./sq. in. (16 to 109 amp./dm. sq.) cover the range at 120° F. (49° C.) from ordinary plating conditions up to an extremely large evolution of hydrogen.

The plate to be measured was deposited on a steel sheet, 2 x 4 in. (5 x 11 cm.), No. 19 gauge (0.044 in.

[1]Chromium Plating Automobiles, BRASS WORLD, April, 1927.

[2]U. S. Patent 1,600,961.

[3]Principles of Electroplating and Electroforming.

or 1.11 mm.), made especially for electroplating. This sheet was inserted in the center of a rectangular sheet 8 x 12.5 in. (20 x 31 cm.), with a total surface area of 100 sq. in. (6.5 sq. dm.). The anode consisted of a similar parallel sheet, with 0.5 in. (12 mm.) spacing between the two sheets. In all cases, an exact measurement was made of the thickness of the chromium, the average thickness being approximately 0.001 in. (0.025 mm.). The plating was done in a 400-gallon (1500-liter) tank. The solution consisted of approximately 250 g./L. of chromic acid and 3 g./L. of chromium sulfate. The temperature was held at 120° F. (49° C.).

In order to obtain the relative abrasive hardness of the various samples, a Norton emery wheel was used. The diameter of this wheel is 2.5 in. (6 cm.) and the face, 0.25 in. (6 mm.). This wheel is made of 100-mesh emery with a medium bond. The wheel was driven by an electric motor, with reduction gears, at a definite peripheral speed of 12 ft. (3.65 m.) per minute. This sheet, by mechanical means, was pressed against the wheel by a weight of approximately 2 lb. (1 kg.).

Samples were cut through in a series of short successive time intervals of 2 seconds each. This method permits the accurate reading of the total time necessary to cut through the plate, and also lessens any influence of increased temperature caused by friction. Knowing the thickness of the plate, its time may be translated to the time necessary to cut through a plate 0.001 in. (0.025 mm.) in thickness. Both the plating and the abrasion tests were carried out by Dr. B. Perkins, Jr.

Results

Possibly the results can be shown most concisely in Table I. The time is expressed in the minutes necessary to cut through a thickness of 0.001 in. (0.025 mm.). The relative hardness, with 1 amp./sq. in (16 amp./sq. dm.) expressed as unity, is given in terms of relative length of time required to cut through a given thickness of chromium.

TABLE I. ABRASION HARDNESS OF CHROMIUM

Current Density		Time	Relative Hardness
Amp./sq. in.	Amp./sq. dm.	Minutes	Resistance
1	16	0.41	1
2	31	2.7	6
3	49	3.8	9
4	62	17.5	43
5	78	10.6	26
6	93	9.7	24
7	109	9.4	23

The error in timing the number of minutes necessary to cut through a given plate is of the order of 5 per cent. The error in measuring the thickness of the plate is of the same order. This gives a reasonable accuracy, when it is considered that certain plates are over 40 times as hard as others. The method of experimentation largely eliminates the human equation. Therefore the results are reproducible.

Different grinding wheels of the same nominal composition require slightly different lengths of time to cut through the same plate, but in this work information is desired as to the relative lengths of time to cut through plates of various degrees of hardness, rather than the absolute time necessary to cut through a single sample. The samples all have a high luster. At the higher current densities there is no indication of burnt or spongy deposits.

The outstanding feature of this work is the extreme difference in wearing qualities of chromium as obtained by varying current densities. This extreme difference in hardness is shown also by a scratch test, in that the sample with 1 amp./sq. in. (16 amp./sq. dm.) can be scratched by hard steel, while the harder samples are considerably beyond file hardness.

The second feature noticed is the maximum abrasive hardness at 4 amp./sq. in (62 amp./sq. dm.) with a slightly decreasing hardness with further increase in current density. It is impossible to state definitely the reason for this decreasing hardness. It is suggested that the results obtained may be a combination of two opposing factors. There is an increased crystalline hardness with increasing hydrogen, and there is also increased hydrogen embrittlement. Possibly this increased brittlement would be attended by an increased tendency to break down, due to lessening of cohesive forces. This thought would be exemplified by the effect of various bonds used in making emery wheels of various degrees of hardness, where the same size grain is used.

Conclusions

Quantitative data show the enormous variation of hardness of chromium, dependent up the rate of deposition as influenced by current density with attendant liberation of hydrogen. Results point to an optimum current density for maximum abrasive hardness. Beyond the maximum condition, it may be that further hydrogen embrittlement takes place at the expense of the cohesive bond in the chromium, thereby giving a resultant decrease in abrasive hardness.

The method used is presented as a convenient means of obtaining the relative abrasive hardness of various electrodeposited plates of different metals.

Cadmium Plating

Q.—We are considering adding a cadmium plating installation to our nickel equipment. We are wondering if you could give us information on the following points:

1.—What is the actual value of cadmium plating on steel and duralumin castings for resisting salt water spraying or immersion? What tests have been made and where could we find a report on these tests?

2.—How does cadmium plating compare in the conditions outlined above with paint finishes, particularly aluminum paint?

3.—Can a cadmium bath be worked alternately with a copper bath or must we install an entirely separate tank and solution for cadmium? The copper is used for plating under nickel.

A.—(1.) See THE METAL INDUSTRY, June, 1928. (2.) No published data. However, cadmium deposits in our experience have proven superior to paints, especially aluminum paint, in resistance to atmospheric corrosion. (3.) We believe this question refers to the possibility of using the same tank for cadmium solution as you are now using for copper. To do this the tank would have to be emptied and washed out every time the change was made. If this occurs frequently, the labor cost of changing solutions and anodes and cleaning the tanks would soon amount to more than the cost of separate equipment. If not cleaned properly, it would result in injurious solution contamination.

—WALTER FRAINE.

Standardized Cleaning Tanks

Q.—In connection with the manufacturing operations at our electrical plant we use, as you can readily appreciate, numerous tanks and machines for cleaning operations, using alkaline cleaning compounds. The machines, we feel, are satisfactory for their purpose, but we believe that there is room for improvement in the design of still tanks in order that the highest efficiency be obtained from the cleaners. In fact, we would like to standardize on the design of a tank for this purpose.

We know, of course, that it is necessary to maintain temperature not lower than 180° or 190° F., and that it is advisable to remove as far as possible any film of oil that might accumulate on the surface of the solution. We have an idea that the position of the heating coils has an influence, that it might be advisable to have a dam across the tank in a certain relation to the coils over which the surface oil might drain; also, that it might be advisable to install a recording thermometer on each tank.

In view of the contact you have undoubtedly had on problems of this sort, we would greatly appreciate your comments on the above, and any information you can give us that will assist in the standardization of tank design for this purpose.

A.—No standard construction of cleaning tanks has ever been adopted. Each manufacturer has units according to his own ideas.

A construction that has many good features and is adaptable to almost any cleaning condition is one that has the steam coils at the front of the tank and a 2 in. angle as a dam extending the full length near the back of the tank. The action of the heated solution in front will force the scum on the top to the back of the tank, where it will go over the dam. By this method the top of the solution will be kept cleaning regardless of whether the work is removed from the side or the end of the tank, and the bottom of the tank is free from pipe coils, which help in cleaning out the tank.

A thermo-regulator always insures a uniform temperature and prevents boiling over of the solution.

In some installations a small pump is placed on the side of the tank and the solution kept agitated by a continuous pumping of the solution in and out of the tank.

—ELECTROMETALLURGIST.

Hard Scale on Bronze Casting

Q.—We are sending you herewith a piece of bronze casting made from a specially manufactured ingot supposed to be composed of copper 83 per cent, tin 4 per cent, zinc 13 per cent and lead (max) ½ per cent. Until recently we had been obtaining satisfactory castings but now we frequently obtain several castings from a pouring on which a dark, hard skin has formed on the heavy part of the casting.

We specially analyzed the sample and found that the mixture is correct. The analysis of the sample showed copper 83.21 per cent, tin 4.07, lead 0.33, zinc 12.30, iron 0.03, aluminum none, phosphorous trace.

We then submitted the sample to several foundrymen, all of them men with many years of experience in the casting of non-ferrous metals and alloys. None of them give a positive reason for this hard skin.

We melt the ingots down by gas. The castings are made in French sand. You will note that the thin part of the casting is without the hard skin, only the heavy part of the casting showing it. Underneath the thin skin the metal is just as soft as in the thin part of the casting.

If you could tell us the reason for this condition and advise some method to eliminate it, it would be greatly appreciated.

A.—On examination of the sample casting and on making a Brinell test, we find there is no appreciable difference in the hardness. The reading shows 100 Brinell on the large part and 109 Brinell on the small. Therefore, as far as hardness is concerned, there is no difference.

There may be a difference, however, in the machining. The scale in the casting is caused by the sand. If aluminum was cast in this same sand it would cause a slight difference in the scale and cause the dark color. Your analysis shows the metal is not at fault, unless your metal contains oxides. We would say the difference in machining is caused by the sand that the phosphor bronze or aluminum has been cast in. This would cause some variation in forming a scale on the surface.

—W. J. REARDON.

Oxidized Finish on Brass Casting

Q.—I am sending you a small casting. Would you be kind enough to tell me how the finish on the casting is produced?

A.—The finish on the casting submitted can readily be produced in a solution of acetate of lead, hyposulphite of soda and water, made as follows:

Hyposulphite of soda	4-6 oz.
Acetate of lead	2-4 oz.
Water	½ gal.

Use solution hot; place work in solution until even blue color is secured; rinse in water and relieve high lights with sewed rag wheel and pumice, or by buffing. Lacquer to protect finish.

The following solution can also be used for the purpose you have outlined:

White arsenic	8 oz.
Muriatic acid	1 gal.
Water	3 gal.

Use cold and follow directions as outlined for the first formula.

—WALTER FRAINE.

Insulation for Racks

Q.—We have been using stopping-off lacquer and rubber for insulating our chromium plating racks. Neither of these gives good results. Can you tell us what we might use to cover our racks?

A.—So far the most satisfactory method of covering plating racks for use in chrome plating is to insulate with bakelite or micarta. This is more expensive in first cost than rubber but stands up well in use.

Rubber disintegrates under the action of the chrome solution and the stopping-off lacquer requires renewal daily if in constant use. No satisfactory cheap method has been devised as yet.

—WALTER FRAINE.

Increased Graphite Duties

AN amendment has been offered by Senator Black of Alabama to the tariff bill now pending in the Finance Committee of the Senate, keeping the tariff on amorphous graphite at 10 per cent and classifying all other types as crystalline graphite carrying a specific duty of 2 cents per pound. At the present time the duties still in existence are 10 per cent on amorphous graphite, 20 per cent on crystalline graphite and 1½ cents per pound on flaked graphite.

Imposing a duty of 2c per pound on the so-called crystalline graphite which includes the material imported from Ceylon and Madagascar for use in crucibles, would, it is claimed, handicap the crucible industry very seriously. It is imperative to use this grade of material in crucibles as after years of experimenting, it has been found impractical to use the American graphite. Reports from the Bureau of Mines, Washington, D. C., edited by Paul M. Tyler, bring out this fact clearly as shown by the excerpts given below.

"Some of the amorphous graphite mined in the United States has been nothing more than shale or slate containing only enough carbonaceous matter to make it black. Other qualities grade into anthracite. Usually it is the physical character of the product that is of utmost importance, and the value of crystalline graphite depends upon its structure and upon the size of the particle quite as much as upon the carbon content. Flake finer than 90 or 100 mesh, for example, is not acceptable to crucible makers, and much large flake (up to about 12 mesh) is desired."

The following is taken from circular 6122 of May 1929:

"American graphite deposits, though numerous and often large, are characteristically low grade. They constitute an abundant source of potential supply, but in normal times they have proved relatively costly to work, and even at the same price, the various products (domestic) never have been able wholly to displace certain imported qualities, notably crucible grades from Ceylon and pencil graphite from Mexico."

That circular has the following to say regarding Alabama graphite:

"The rock is largely quartz with some mica and apatite, and with rarely more than 3 or 4 per cent graphite. More efficient milling has made possible a 75 per cent recovery from rock containing only 2 per cent of graphite, the yield per ton being about 25 pounds of graphite."

California graphite is treated as follows in the circular:

"The smallness of the flake makes it of little value for crucibles and refractories."

Further information is given in circular 6142 published in May, 1929.

"According to one authority fully 600 graphite mines have failed in the United States, and the records show that of all these properties, scarcely a score have succeeded in operating for as much as a year or two. Throughout the country, in fact, there are scarcely a dozen states in which efforts have not been made at some time to exploit graphite deposits. Failures inevitably occur in all kinds of mining, but the disheartening feature of the record of graphite mining in this country is that so few ventures have paid back the money put into them and none has been a conspicuous success.

"The graphite industry, it should be remembered, is in many respects a complicated one. Attempts to state its problems as broad generalities tend to obscure the facts that there are three or four wholly different types of graphite with several grades of each type. Moreover, graphites of nominally the same grade may not be interchangeable because of differences in purity and physical condition.

"Both Alabama and Pennsylvania graphite dust (and flake) were said to be of inferior refractory quality because of their large silica and mica content which fuses under heat."

Foreign graphite is now being purchased by the crucible manufacturers in the face of higher prices, and the need for financing these purchases for six months to a year while the material is in transit. Crucible manufacturers would welcome the chance to use American made products if they were suitable, but the demands made upon metal melting crucibles make the use of American graphite undesirable.

Permanent Molds

Q.—We are interested in the subject of semi-permanent molds and would appreciate any information relative to composition of mold mixture and other data which you could furnish. We would like to use these molds in connection with the casting of bronze and aluminum.

In your issue for October, 1925, there was an article on this subject by Edward D. Gleason. One of the mixtures which Mr. Gleason recommends is composed of 7 parts soapstone and 3 parts powdered asbestos, to which is added a binder composed of 3 parts full strength silicate of soda solution and 2 parts water.

We tried this mold mixture on aluminum and in every instance the metal burned into the sand. Mr. Gleason claims for this mold mixture high heat resisting qualities and as we were extremely careful in the preparation of the mold mixture we cannot account for the metal burning into the sand. We would appreciate your suggestions on this mixture.

A.—We do not have any information on composition of mold mixtures for permanent molds. We have experimented quite a lot and have never found any composition that will stand up for over a few castings.

The most reliable is the cast iron mold with a high carbon content. Plaster molds are used successfully for casting yellow brass with ½ of 1 per cent aluminum added to the metal. These plaster molds are made from various compositions. One that has been used successfully is composed of plaster of paris 90 per cent and lime 10 per cent. This is mixed together with 1 quart of water to 3 pounds of the plaster and lime mixture. It is essential that the correct amount of water and plaster be used and then poured in the mold.

Suitable apparatus must be made to draw the pattern from the mold. The mold is then dried in an oven for ten hours at 500° to 600° F., then taken out and poured as soon as possible. The mixture used in this metal is 59½ copper, 40 per cent zinc, ½ per cent aluminum.

Castings made in this manner are very sharp and resemble castings made in dies. Unfortunately, the mold lasts only for one cast, but it may be ground up and used again with plaster, using in proportion of 50 per cent old mold and 50 per cent new material.

As stated above, metal molds of different compositions for different alloys are the most suitable, and some headway is now being made in this direction.

—W. J. REARDON.

How We Get Safety

Safety Methods in a Large Brass Plant

By GEORGE A. SEYLER
Works Manager, The Lukenheimer Company, Cincinnati, Ohio

FROM A PAPER READ AT THE ANNUAL SAFETY CONGRESS

SAFETY is the natural result that we may expect from a certain effort that we put forth. You know there are a lot of people that say about safety: "Oh, we haven't had any lost-time accidents." They whisper, and they touch wood. They might as well shake a rabbit's foot; they'd get the same results. Safety is the result of certain definite things that you do in industry.

Years ago we tried signs. We hung up all the pretty signs, "Be Safe"—"Look Out for Your Neighbor," etc.; but that didn't do the trick. For a while I thought it might—even thought we didn't have enough signs, but I found out that the more signs we put up the less they were regarded—and of course, if they stayed up long enough they got rather dirty. We still use signs but we don't use them as a main punch; they are only a reminder. The main punch starts with education of the foreman.

Now, what is this education? Get them in a room and have a school or a definite arrangement whereby you tell them a lot of statistics, and things of that sort? No. We get them together once a month and part of the program is safety. We devote three-quarters of an hour or an hour to that subject.

Did they find out what I want to know about safety? No, I wasn't interested in that. I was interested in what *they* knew about safety—getting their slant on it because I knew that I was like the manager of a baseball team. If he doesn't get the cooperation of the bunch out in the field he can't bring home the pennant. I told those fellows when they came together that each man represented at least 15 years of experience on any subject pertaining to their work, because they had lived in it and had worked in it. They had personal experience. Now, there is nothing more valuable in the world than to get the combined experience of all those men—10 men, representing 150 years of experience in accidents!

Here are some of the things that they said, and, mind you, these are frank opinions of their own. Their remarks are not out of some books that they read and got up to recite, but they are the conclusions that they have reached through their own experience.

"It is the duty of every foreman to investigate every violation of the safety rules, whether the violations have resulted in accident or not." If a man is careless with a dirty gangway or improper stacking of product in a plant, or things of that kind (whether anybody is hurt or not), we consider the violation of the safety rule the important thing, not whether it results in accident, or not. It took a little while to get that thing over, of course, because we are all prone to put importance on those things only that are outstanding, or might cause us real loss.

What did the foreman say further? "It is the duty of the foreman to do all he can to prevent accidents by being on the alert all of the time to prevent accidents, and by taking steps to prevent the recurrence of an accident when it occurs." When an accident happens in our plant we do not say, "How did this accident happen?" but, "What caused the accident?" Because they say further:

"Accidents are preventable and can be prevented to great degree by the foreman exercising constant vigilance." That is the price of safety. Eternal vigilance is the price of safety as well as analyzing sources from which injuries come.

They said a mouthful here in this next thought. See what you think of it: "No individual has the right to authorize or even encourage action which may jeopardize life or limb."

Another thought. "There are two agents of safety precaution. One is mechanical—guards on machines and so forth; and the other is human living-and-acting safety." It means human living-and-acting safety.

There was a time when a man who took extraordinary precautionary measures was considered "sissified." He wasn't a regular fellow because he didn't take chances. I could tell you about some of the utilities where men disdainfully threw away guards saying, "Those are for the cubs. We old seasoned veterans don't need those things." That has all been changed. Their education has been brought to the point where they pride themselves on being able to use safety appliances intelligently. You know, when we first started out with safety appliances they seemed to be a nuisance; they seemed to restrain and crowd you in. Take the matter of goggles or foundry shoes, gloves, or anything that you have in a foundry to prevent accidents. In the beginning there was a lot of difficulty. But when a man finds that he is using good horse-sense, setting a good example, and getting somewhere by intelligently using these appliances, then he has pride in his work. And there is nothing that can stop a workman from getting the best results if he has pride in his work and his accomplishments.

The crux of our safety work lies in the next thought. "Enforcement of rules and orders on safety should be uppermost in the minds of all foremen. To violate orders of this nature is the same as violating any other order, which of course, is not tolerated." Violating a safety order is no different than violating any other order in your plant. What do we mean by that? Do you permit promiscuous late-coming? Do you permit fighting in your plant? You might dismiss two men who did either of those things. Another man, although he is not a fighter, and never tardy, will disregard the use of safety measures which you have put in the plant.

The foreman said: "The men will put importance on only those things that we ourselves (as managers) put importance on." So when we sum up this entire problem, we find this; that it begins with management and it ends with management. It is our job to educate these fellows that come into work with us.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1929 by The Metal Industry Publishing Company, Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

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Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, Beekman 0404. Cable Address Metalustry.

Vol. 27 New York, December, 1929 No. 12

Contents

THE METAL INDUSTRY is regularly indexed in The Industrial Arts Index

Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 91

Editorial

Keeping Business Steady

ONCE more we are faced with the fact that history repeats itself over and over again. We can make the same mistakes, commit the same blunders and suffer the same consequences. It is no excuse to say that the conditions were not identical. No two situations can be alike in every last particular. The strong similarity which exists, should be sufficient indication to warn us of what is coming.

We have had three years of high and increasing prosperity. As a result the stock market got completely out of control, not only of itself, but of the Federated banking authorities. The inevitable seemed to have been indefinitely postponed and some trusting souls believed that it would never happen. But of course, it did as everyone knows by now from the recent landslide of securities, good, bad and indifferent.

Coming now to the statistical facts, it has been estimated that only one person in twenty-five in the United States is a holder of securities, or about 4,000,000 in all. Of these 4,000,000 a large proportion own their shares outright or are paying for them in installments to the companies for which they work and through whom they are purchasing their stock. Those who are still holding their stock for one reason or another, have simply paper losses to show. No one knows what proportion of the total loss in represented by paper and what by cash, nor is it over-important that these details should be at hand. There are many other facts of more vital concern before us.

The stock market did not, and cannot ever in these days of Federal reserve banks, bring on a business depression. It can only act as the indicator. In other words its gyrations are effects and not causes. That it is an imperfect indicator we know. Business did not fly so high as the stock market and it has not fallen so low. As an instrument it is much too sensitive and too easily effected by slight differences.

Two or three months ago the wheels of industry began to slow down slightly. Automobile production was headed for a decline. As a consequence steel output fell off. This tendency continued and finally the market, badly overloaded as it was with loans, sank under the weight, and as it always does, sank out of all reason. The worst of these convulsions are now past, with the patient quite weak. The only question that interests us all today is what about business?

We are in for a period of readjustment, the length of which is the subject of discussion. It can be long and hard but it need not last more than a very short time. The underlying structure of American business is in a very much better state than it was in 1921 and 1922. Our inventories are low, cash surpluses of industry are large, credit is cheap. This is altogether different from the conditions eight years ago. Now, if ever, we have to ward off the possibility of a "psychological depression." In certain lines a decline is inevitable. Expensive luxuries will not be purchased as freely as they were last year, but they are a small part of our total national output. If basic commodities continue to be consumed, if clothing, shelter, household goods and the standard forms of amusement, entertainment and culture continue to be taken, there will be little if any depression. Consumption depends almost entirely upon employment. If we have normal employment the mass of people will continue to buy and business will go on.

It is more than small comfort that the administration has taken action without delay in this emergency. President Hoover has called in to conference the leaders of the most important key industries, to use this time, critical as it is, to make the capital expenditures which are necessary for their own well-being. The railroads have agreed to spend much more heavily this year than ever for new equipment. Public utilities are ready to spend for new construction and betterment more freely than ever before. It is felt that the building trades may improve this year, after their recession of 1929, due to easier money conditions which will enable them to borrow at reasonable rates. So then we have the railroads, the public utilities and perhaps building, looking forward to an expanded year. The States and the Federal Government are planning for new construction, far beyond their past expenditures as this is the period in which such improvements should be made. Labor has agreed to make no demands for increased wages; similarly leaders of industry have agreed not to cut wages or to rush into sharp contractions with consequent laying off of large forces. Federal taxes will be reduced.

All these moves are eminently correct. They point neither to inflation, a fresh boom, nor a sharp rebound from this slump. They are intended to keep business steady at a good level, consistent with the producing and consuming power of the nation. A program of this sort spells sanity and constructive enterprise, the avoidance of depressions as well as the booms of over-confidence.

Tariff on Graphite

THERE is pending before the Senate, in the Finance Committee, the question of a revised tariff on graphite. Pressure has been brought to bear by the American producers to increase the duty in order to stimulate the American production and consumption.

American graphite has been in existance for many years. It is considerably lower in price even now than foreign graphite. It is much easier to obtain, as the

imported material takes from six months to a year in transit, locking up large amounts of capital. Many experiments have been performed and work has been carried on for years in the attempt to use American graphites for metal melting crucibles. In a word, the American crucible manufacturers have done their best in every possible way to co-operate with the graphite producers, and to use their product. If they have been unsuccessful, it is not for lack of effort, but because American graphite is not suitable for crucibles.

The crucible manufacturer has had many troubles in the last ten years. His business has shrunk under the competition of electric furnaces and open flame furnaces. Competition has been keen, forcing prices down to a minimum. Thirty per cent of the crucible industry has been eliminated in the last six years. In the face of these hardships, crucibles have been improved, their life has been increased by almost 100 per cent, and the industry has made its products more uniform and of greater value to metal melters. According to the concerted opinion of the crucible manufacturers, no increase in the price of foreign graphite will make it possible for them to use American graphite, as the foreign grade is the only one suitable. The result of an increased tariff will be only to increase the price of crucibles to metal melters which will force them to turn to other types of equipment for their work. This may result in making crucible manufacture in the United States a thing of the past.

The crucible industry asks for relief from an attack of this kind. Metal melting plants should be vitally interested, as they will also have to bear the burden of any new tariff.

An Explanation

IN our issue for August, 1929, we published three articles, reprints of papers read before the convention of the American Electroplaters' Society in Detroit, July 8-11. These papers were read by men who, according to our records, were not members of the society and who, we believed, had full rights over their papers to release them to the technical press or not, as they saw fit. These authors gave their papers in person to our Detroit representative, Mr. F. J. Huntley, who attended the meetings, with their permission to publish without delay.

It has been brought to our attention by Horace H. Smith, Supreme President, that some dissatisfaction exists because of the publication of these papers before they appeared in the "Monthly Review." For that reason, we are giving the above explanation. So much for the facts.

We should like to add something in addition, however. We should like to point to seventeen years of continued unremitting and untiring effort on behalf of the American Electroplaters' Society. Every day of these seventeen years we have been with the society, even though we have disagreed with some of its rulings. We have abided by its decisions and accepted them in good spirit. In this particular case, we do not believe that we have overstepped the boundaries of our rights, even though two or three members seem to disagree with our viewpoint. We regret this difference of opinion deeply for the sake of the Executive Board of the Society whose faithful work and capable management was rewarded by re-election to office in a body. We regret sincerely that any act of ours, innocent as it was, made it necessary for them to take any cognizance of a disagreement. The American Electroplaters' Society will sail fastest if it sails smoothly, and it is our unswerving purpose to remove every obstacle in the way of smooth sailing, even though it may be to our own discomfort. We shall continue to work with the responsible and understanding executives and members of the Society to further its interests in every possible fashion.

Platers Membership Drive

THE American Electroplaters' Society has entered upon a project for the coming year, of increasing its membership. This campaign, under the direction of George B. Hogaboom chairman of the Membership Committe, begins at once and Mr. Hogaboom aptly states that his committee consists of every member of the Society. No better committee could possibly be appointed.

The plan is for each member either to get another, or to send the name, address and place of employment of a plater who would make a good member. The prospective member will receive a communication asking him to join, this communication to be followed up until some definite answer is given. The supreme society will co-operate, seeing that new members are placed in the most convenient branch.

No words could be too strong, or too many in number, in approbation of this movement. We commend it to the wholehearted support of the present members by whose own efforts their Society will grow. We "point with pride" to an example, the Los Angeles Branch which just received a permanent charter and celebrated the happy event on October 12th last. Only a year ago a temporary charter was obtained; to-day that Branch has sixty members. For this work, all praise, not only to the Los Angeles Branch but to the national society, as children take after their parents and local branches resemble their parent organization.

We know that the whole society to a man will bend its back to push along the membership campaign to success.

January Publication Date

IT is necessary for us to make our annual announcement at this time about our January issue, the Annual Review Number. Our readers are accustomed to receive THE METAL INDUSTRY about the tenth of each month. January, however, is the exception to this rule because it is our largest and most complex number, including a variety of reviews, tables and charts.

Our issue for January, 1930, will probably reach the hands of our subscribers during the week of January 13th. We ask their forbearance for these few days' delay and hope that they will be recompensed by the additional information which we will include in this issue.

New Books

Outline of Metallurgical Practice. By Carle R. Hayward. Published by D. Van Nostrand Company. Size 6 x 9, 612 pages. Price $7.50.

This is a work which brings up to date the methods of recovering various metals. Most of it is devoted to the recovery of metals from their ores, but there are chapters on non-ferrous alloys including copper, aluminum, zinc, nickel, tin and lead. The work is a valuable text book for students or for reference.

Popular Research Narratives. Collected by the Engineering Foundation, New York. Size 5 x 7 inches, 184 pages, price $1.

This book comprises fifty brief stories of research, invention or discovery, directly from the "men who did it." The range of subjects is very wide, covering all industry. Included among them are the following: Super Conducting Copper; Thoriated Tungsten Tubes; Common Salt in Metallurgy; Brass; Electrolytic Iron; Hardened Copper; Beryllium; Chromium; Mercury for Power Plants; Aluminum Plating.

Bibliography of Bibliographies on Chemistry and Chemical Technology. Published by the National Research Council as Bulletin No. 71, the first supplement to this bibliography. Compiled by C. J. West and D. D. Berolzheimer for the National Research Information Service of the National Research Council, Washington, D. C. Size 7 x 9½, 160 pages. Price $1.50 per copy.

This supplement contains approximately 4100 bibliographies classified under 1050 headings. Metal Spraying, Metallurgy and Metallography are among the subjects covered.

Commercial and Industrial Organizations of the United States. 1929 edition. Published by the U. S. Department of Commerce, Washington, D. C. Size 6 x 9, 272 pages. Price 60 cents. Obtainable from the Superintendent of Documents, Washington, D. C.

In this new edition of a comprehensive directory of trade associations and non-profit making commercial organizations, are listed more than 13,000 names, an increase of nearly fifty per cent of the previous (1926) edition. There are also included the names of the secretaries of all national, international and interstate organizations. This compilation is extremely valuable as it is a quick and easy guide to those who need specialized information which can be best obtained from specific trade organizations.

Technical Papers

The Polytechnic Institute of Brooklyn. Bulletin of the evening session for 1929-30.

Tungsten, by Colin G. Fink. Published as part of "The Mineral Industry," London, England.

An X-Ray Study of Firebrick, by Albert E. R. Westman. Bulletin No. 193. Engineering Experiment Station, University of Illinois, Urbana, Ill. Price 15c.

Report of the Oxy-Acetylene Committee, International Acetylene Association, 30 East 42nd Street, New York City. An 86-page booklet giving full data.

Antimony, by K. C. Li. Published as part of "The Mineral Industry," London, England.

Statistical and other data on the world's antimony industry during 1928.

Report of the National Screw Thread Commission. Miscellaneous Publication, Bureau of Standards Number 89. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Brass Pipe Nipples. Commercial Standard CS10-29 of the Bureau of Standards, Department of Commerce, Washington, D. C. Price 10c. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Sensitive Arc Lines of 50 Elements; Including Notes on the Use of R. U. Powder in Spectroscopic Analysis, by J. W. Ryde and H. G. Jenkins. Obtainable from Adam Hilger, Ltd., 24 Rochester Pl., Camden Road, London, N.W. 1, England.

Revealing the Technical Ascent of Man in the Rosenwald Industrial Museum, by Waldemar Kaempffert, Director of the Rosenwald Industrial Museum of Chicago, reprinted from The Scientific Monthly, June 1929, Vol. XXVII, pages 481-498.

American Standards Yearbook for 1929. American Standards Association, 29 West 39th Street, New York. This year book lists about 150 national standards which have already been completed and about 175 other national projects under way.

The Practice of Spectrum Analysis with Hilger Instruments. Fourth Edition of a compilation by F. Twyman, with contributions by various authorities. Available from Adam Hilger, Ltd., 24 Rochester Place, Camden Road, London, N. W. 1, England. Price 1s. 6d., net.

Acids and Caustics, a "Safe Practice" pamphlet prepared by the National Safety Council, Chicago, Ill.

An illustrated pamphlet describing safe practice in handling of acids and caustics, written by W. Dean Keefer, director of the Industrial Division of the Council.

Aluminium and Bauxite, by C. L. Mantell. Published as a part of "The Mineral Industry," London, England.

Full statistical résumé of the aluminum and bauxite industries of the world for 1928, with data on plant operations, expansions, output, prices, etc. Aluminum salts are also covered.

Trade Practice Conferences. Prepared by the Federal Trade Commission and available only from Superintendent of Documents, Government Printing Office, Washington, for 25c.

A new edition containing 56 conferences on various subects, including gold-filled watch cases, lacquer, Sheffield plated silver hollow ware, and many other lines not related to metals or finishing.

The Welding of Ferrous and Non-ferrous Metals by the Atomic-hydrogen Flame, by R. A. Weinman, research laboratory, General Electric Company, Schenectady, N. Y.

Data on welding of tungsten molybdenum cast iron, alloy steels, aluminum and its alloys, brass, nickel, with full description of the equipment and its operation. Fully illustrated with photomicrographs.

Oxwelding Aluminum and its Alloys. The Linde Air Products Company, 30 East 42nd St., New York City. This paper describes in detail oxwelding processes as applied to aluminum in all its forms. It includes complete instructions for oxwelding both cast and sheet aluminum and also the strong aluminum alloys which have lately become so important in manufacturing processes.

Correlation of the Ultimate Structure of Hard-drawn Copper Wire with the Electric Conductivity, by R. W. Drier and C. T. Eddy. Technical Publication No. 259 of the American Institute of Mining and Metallurgical Engineers, 29 West 39th Street, New York City.

The paper draws the following conclusions.

Crystal orientations in hard-drawn copper wire becomes preferred as one penetrates from the skin to the core.

The orientation is one in which the cube edge is parallel to the fiber axis or direction of drawing.

The resistivity measurements indicate that the resistivity increases with the degree of this particular type of preferred orientation.

From this work and that of Harris it also appears that a similar relation exists between the tensile strength and the degree of preferred orientation.

Crystal orientation in annealed copper wire is not preferred.

The average specific resistivities from the skin to the core in annealed copper wires did not vary. In the event that the resistivity varies with the degree of preferred orientation, this is as would be expected.

The nature of the material at the core of the hard-drawn wire, owing to its preferential orientation, approaches that of a single crystal. Hence, evidence seems to refute the theory of higher conductivity in single crystals.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Analyses of Nickel Solutions

Q.—I am sending you three bottles of solution that I should like to have analyzed. The nickel solution gives trouble when plating brass castings. White spots appear about the size of a pin head. Sometimes the nickel plate is streaky and grey.

A.—Analysis of nickel solutions:

1.	Metallic nickel	3.20 ozs.
	Chlorides	2.62 ozs.
	pH	5.4
2.	Metallic nickel	2.43 ozs.
	Chlorides	2.27 ozs.
	pH	5.2
3.	Metallic nickel	2.51 ozs.
	Chlorides	2.33 ozs.
	pH	5.2

The pH of all 3 solutions is too low. Add 10 ozs. of 26° ammonium hydroxide to each 100 gallons of solution for each tank.

We believe that the white spots you refer to are small pores or impurities in the brass castings and would suggest that you copper plate the castings before nickel plating.

—O. J. S., Problem 3,912.

Blue on Cast Iron

Q.—Please comment on the following formula for producing a blue oxidize on polished cast iron:

Nitrate of lead	4 ozs.
Nitrate of iron	2 ozs.
Hyposulphite of soda	16 ozs.
Water	5 gal.

Use the solution hot.

Do you consider this formula reliable? I used hyposulphite of soda in crystallized form and failed to get the finish desired. Should you find this formula unsuitable for my work, please let me know of a dependable formula for it.

A.—We have had no experience with the formula you mention, but doubt if you will be able to produce a satisfactory blue finish directly on your cast iron without the aid of heat. If you can provide means whereby you can heat the work to 700° F., a blue color will be produced that is satisfactory.

The usual method is to place in an iron pot equal parts of potassium, nitrate and potassium nitrite, heat until the mixture is in a molten state and then place article in the bath for a few minutes. When the work is taken from the molten bath, it should be immediately plunged into warm water and dried in sawdust that has been moistened with paraffin oil.

—O. J. S., Problem 3,913.

Chromium Plating Practice

Q.—In connection with our nickel, we are using a chromium plating solution. I find that by carrying a high chrome content in our solution I get better results than with the contents advised by Professor Baker, and at the same time do not use as high a current density as with the lower chromium content solution.

The normal solution advised by Professor Baker is 7.5. I am carrying 25 per cent more than this in our solution, and the last analysis showed 9.37. I would like to have your advice as to what you consider the danger point in chrome plating for iron content. Also, what can you advise me between a lead-lined and a glass-lined tank, and are steel anodes or lead anodes preferable?

We have an acid copper tank containing a quantity of dissolved iron. Is there any practical way to remove this iron from the acid copper solution?

A.—It is well known that in a chromium solution with a fairly high chromic acid content (12 N. solution), better distribution of the current is had, and it also allows a lower cathode current density with a correspondingly lower temperature. Schneidewind has shown by the work he has done at the University of Michigan that the iron content has a marked effect on the current distribution and that when the iron content had reached 4.9 grams per liter, it is impossible to obtain current efficiency measurements. Therefore, we would say that when the iron content is 0.5 oz. per gallon, the efficiency of the bath is quite low.

We would recommend a glass lined iron tank, tank to be placed upon glass insulators and steam coil, if used, to be perfectly insulated also. We prefer the 6 per cent antimony lead anodes, as results have shown that with the use of same the tri-valent chromium content can be kept quite low.

The iron content of an acid copper solution, if small, does not seem to materially affect the character of the deposit. If present in large quantity, say above 2 ozs. per gallon, the deposit is rough and streaky. Tannic acid has been recommended to remove the iron from an acid copper bath, but same cannot be used in presence of some colloids. We would suggest that you experiment on a small volume of the solution and advise as to results.

—O. J. S., Problem 3,914.

Copper and Nickel on Stereotypes

Q.—We want to obtain information regarding formulas for plating of copper or nickel upon stereotype plates such as are used in printing newspapers.

A.—Formula for acid copper solution:

Copper sulphate	28 ozs.
Sulphuric acid, C.P.	7 ozs.
Water	1 gal.

Temperature, 75° F.; 25 amperes per square foot.

Formula for nickel solution:

Nickel sulphate	18 ozs.
Ammonium chloride	2 ozs.
Water	1 gal.

Temperature, 90° F.; pH, 6.6; 4 volts and 30 amperes per square foot.

Write to the Superintendent of Documents, Washington, D. C., for a copy of Circular No. 52, entitled "Regulation of Electrotyping Solutions" and to H. G. Guiteras, Field Secretary, International Association of Electrotypers, Leader Building, Cleveland, Ohio, for a copy of booklet entitled "Nickel Electrotyping Solutions."

—O. J. S., Problem 3,915.

Dip Gold Plating

Q.—I would like to have information about deep gold plating. Is there any book I can get on this subject?

A.—If you had stated what class of work you intend to plate, we would have been in a position to advise you in detail.

The salt water gold solution is used to a great extent on novelty work, while for heavy deposits the cyanide solution should be used.

Formula for salt water gold solution:

Potassium ferrocyanide	8 ozs.
Sodium phosphate	4 ozs.
Sodium carbonate	2 ozs.
Sodium sulphite	1 oz.
Water	1 gal.
Gold, as fulminate	2 dwt.

The solution should be boiled thoroughly before using and placed in a porous pot that is surrounded by a cylinder of zinc. The outside tank or container should contain a saturated salt solution and heated to boiling temperature. A copper rod is attached to the zinc cylinder and extended over the porous pot on which is suspended the work to be plated.

Formula for electro-gold solution:

Sodium cyanide	1 oz.
Gold, as fulminate	5 dwt.
Phosphate soda	1 oz.
Water	1 gal.

Temperature, 130° to 150° F.; voltage 1 to 1½; amperage, 1 to 2.

"Principles of Electroplating and Electroforming," by Blum and Hogaboom, contains reference on gold plating and is for sale by THE METAL INDUSTRY.

—O. J. S., Problem 3,916.

Dip Silvering

Q.—I would like to know how to produce a silver finish by the dip process. I want to know what to use and what the method is.

A.—Formula for dip silvering:

Silver nitrate	½ oz.
Sodium cyanide	1½ ozs.
Sodium chloride	1 oz.
Water	1 gal.

Dissolve the silver nitrate in water and then add the sodium cyanide which has been previously dissolved in water. When the precipitate that is first formed has been redissolved by the sodium cyanide, add the sodium chloride.

Best results are had at a temperature of 80° to 90° F. The brass articles should be tumbled bright or passed through a bright dip and through a cyanide dip, then placed into the silver dip for a few seconds. When thoroughly covered with silver, rinse in clean cold water, then in a soap and ammonia solution made of one ounce "Ivory" soap chips and ½ pint of ammonia to 5 gallons of water, then in boiling hot water for a few seconds. If the drying process is followed closely, a clear bright deposit of silver will be obtained. Work should be lacquered finally with a clear cotton lacquer.

—O. J. S., Problem 3,917.

Matt Finish for Watch Dials

Q.—I am sending you two samples of watch dials, one a Swiss vitreous enamel dial on which you can see it would be impossible to use a sand blast without removing the lustre from the figures, the other is just a plain painted dial that has the same matt finish. These are both old dials and therefore they are not white, but the finish is what we are trying to get. All of the watch companies are using this finish, both here and in Europe. Can you tell us how to produce this?

A.—The finishes on the two watch dials have been produced in the following way:

The oval dial is made of sterling silver and the matt surface has been produced with the sand blast.

The other dial is made of brass and the matt surface has been produced in the following dip:

Bichromate of soda	8 oz.
Sulphuric acid	4 oz.
Water	1 gallon

Before immersing in this dip, clean thoroughly to remove all grease or oil and let work remain in dip for 5 to 10 minutes. Rinse thoroughly in clean cold water, pass through cyanide dip, then silver plate just long enough to produce a nice white finish. Finally, coat with a clear silver lacquer.

The enclosed sample was finished in the bichromate dip and if examined closely the matt surface will be found to be identical with the one you sent.

—O. J. S., Problem 3,918.

Nickel Solution Analysis Methods

Q.—I would like to have some information on methods of analyzing nickel solutions. Can you refer me to proper sources of such information?

In the meantime, I am sending you a sample of a nickel solution that I would like to have you analyze for me and recommend improvements.

A.—Analysis of nickel solution:

Metallic nickel	2.88 oz.
Chlorides	1.70 oz.
pH	6.8

The chloride content of the solution is a little low and the pH is entirely too high.

Add 1 oz. of sodium chloride to each gallon of solution and to each 100 gallons of solution add 6 oz. of sulphuric acid.

For method of analysis of nickel solution, see the June and July, 1926, issues of THE METAL INDUSTRY.

—O. J. S., Problem 3,919.

Steel Effect on Cadmium Plated Iron

Q.—Can you advise me how to get a good half-polished steel effect on cadmium plated wrought iron products? I desire a perfectly flat black easily rubbed off the high spots which will, however, last as long as the exposed cadmium plate, perhaps three years.

A.—After the work has been cadmium plated and the rough polish effect produced by the use of either a soft rag wheel with pumice and water or a dry brush brass compound, the work is painted, or it is immersed in the following mixture:

Drop black ground in japan	1 lb.
Turpentine	1 qt.

The work is then set aside for a few minutes or until the black color has had time to set, when the highlights are relieved or cleaned by using a rag that has been moistened with turpentine.

Very pleasing effects can be had by this method, depending upon the design of the article and the skill of the operator.

—O. J. S., Problem 3,920.

Verde Green on Copper Plate

Q.—Please give me instructions for producing a verde green finish on copper plated articles. I would like to have a finish that will be permanent and will not come off. Please include formula and full directions.

A.—A verde green can be produced by the electric current in the following solution:

Copper sulphate	12 ozs.
Potassium bi-chromate	4 ozs.
Zinc sulphate	2 ozs.

Use solution cold, with 8 to 12 volts. Copper or carbon anodes can be used. If the color is too yellow, add a little bicarbonate of soda to the solution. As soon as the verde appears on the work it should be taken from the solution and hung in the air without rinsing, to dry, which causes the verde to form rapidly.

—O. J. S., Problem 3,921.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,720,756. July 16, 1929. **Metallic Alloy.** Henry A. Behrens, East St. Louis, Ill., assignor of one-third to Clark Nixon and one-third to Edward E. Miller, East St. Louis, Ill.

As a new article of manufacture, an electrode, practically free from becoming electrolyzed by the passage of current therethrough and comprising, by weight, tin 2 per cent to 10 per cent; copper ¾ per cent to 2 per cent; lead 10 per cent to 25 per cent; bismuth 5 per cent to 20 per cent; and antimony, by difference.

1,721,092. July 16, 1929. **Metal-Spraying Device.** Charles Marshall Saeger, Jr., Washington, D. C.

In a metal spraying device, a casing, a high frequency induction furnace within said casing, means for continuously feeding the metal to be sprayed into said furnace, and means for spraying the molten metal.

1,721,768. July 23, 1929. **Magnesium Alloy and Method of Making Same.** Edward C. Burdick, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich., a Corporation of Michigan.

The method of making a copper-manganese-magnesium alloy, which consists in interfusing with magnesium a relatively small amount of supro-manganese having the copper and manganese present in approximately the ratio of seven to three.

1,721,814. July 23, 1929. **Soldering Composition.** Karl Geisel, Levallois-Perret, France, assignor, by mesne assignments, to Aluminum Solder Corporation of America, New York, N. Y.

A soldering composition consisting of about 4⅓ per cent (by weight) of aluminum, 66⅔ per cent of zinc, and 29 per cent of tin, and having a soldering temperature of about 260° centigrade.

1,721,949. July 23, 1929. **Plating and Polishing Electrode.** Philip E. Edelman, Chicago, Ill.

A plating and polishing anode having a fabric cover therefor, concentrated chemicals in substantially solid form held within said fabric cover, and a finely divided polishing powder combined with said chemicals and proportioned to penetrate therethrough when said fabric cover is wetted with water.

1,722,025. July 23, 1929. **Process for Brazing Copper Alloys to Iron Alloys.** Hans Wagener, Berlin-Wilmersdorf, Germany, assignor, by direct and mesne assignments, of one-fourth to Heinrich Marzahn, Berlin-Wilmersdorf, Germany, one-fourth to William M. Barry, Detroit, Mich., and one-fourth to Theodore C. Betzoldt, Marvin A. Smith, and Frank J. Cushing.

A process for brazing copper and gray iron sections together where the sections are provided with a pocket recess therebetween, the gray iron section first is treated with hydrochloric acid solution, the pocket recess between the parts is filled with a special brazing flux and binding material and the whole mass subjected to a high heat treatment nearly to the melting point of the copper section, and molten brass introduces within the pocket recess, permeating the brazing flux and completely filling the recess, followed by slowly cooling of the parts.

1,722,124. July 23, 1929. **Method of Casting Copper Alloys.** Carl Adey and Carl Piel, Solingen, Germany.

The herein described method of casting in practically closed metallic moulds copper alloys of high melting points, to produce formed bodies, which comprises flowing the molten alloy smoothly and gradually into the mould and causing air to escape thereby through fine outlets made in the wall of the mould from the portions thereof likely to be shut off by the molten metal, and removing surrounded portions of the mould immediately upon solidification of the cast alloy so as not to hinder free contraction of the casting upon subsequent cooling.

17,385 reissued. July 30, 1929. **Aluminum Alloy and Method of Manufacturing the Same.** Pierre Berthélemy and Henry De Montby, Paris, France.

A process for the manufacture of an aluminum alloy comprising fusing in a plumbago crucible lined with magnesia and containing a mixture of wood charcoal, calcium fluoride, oxide of magnesium, and arseneous acid, a mixture of copper, manganese, ferro-silicon, tungsten, magnesium, and aluminum, so as to produce a rich alloy, running the rich alloy into ingot moulds, and subsequently mixing the rich alloy with pure aluminum.

1,722,281. July 30, 1929. **Die Casting and Method of Producing Same.** William J. During, Syracuse, N. Y., assignor to Precision Castings Company, Inc., Fayetteville, N. Y.

The method of producing a die cast article comprising supporting a wooden core within a die and spaced from the walls thereof, and forcing molten die casting metal at a temperature higher than the combustion point of wood into the die under high pressure.

1,722,358. July 30, 1929. **Alloy and Method of Making Alloys.** Kaare Svaar Seljesaeter, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

An improved ternary alloy comprising not more than 4 per cent antimony, not more than 1 per cent arsenic, and the remainder lead.

1,722,949. July 30, 1929. **Metal Coating Metal Sheets.** Earl R. Wehr and Carl C. Mahlie, Middletown, Ohio, and John R. Cain, Washington, D. C., assignors to The American Rolling Mill Company, Middletown, Ohio.

A process of coating ferrous sheets with zinc and aluminum which consists in passing the sheets through a flux and into a molten bath of the zinc and thence up through a molten alloy of zinc and aluminum floating on the surface of the zinc.

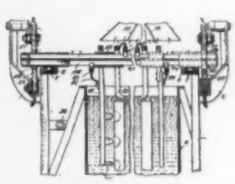
1,723,067. August 6, 1929. **Method and Composition of Matter for Coating and Coloring Metal Articles.** Aladar Pacz, East Cleveland, Ohio.

A dipping solution for producing an adherent colored coating on metal articles containing a soluble molybdate and a soluble fluorine compound.

1,723,277. August 6, 1929. **Aluminum-Plated Article and Process for Producing the Same.** Daniel Gray and Richard O. Bailey, Oneida, and William S. Murray, Utica, N. Y., assignors to Oneida Community, Limited, Oneida, N. Y.

The process of electroplating aluminum on a base of suitable material, which consists in using the base as a cathode and an anode of aluminum, in an electrolyte comprising a solution of an aluminum salt of an amido-benzene sulphonic acid, and passing a current through the electrolyte from the anode to the cathode.

1,723,480. August 6, 1929. **Electroplating Machine.** Albert H. Hannon, Chicago, Ill.



The combination in an electroplating machine, of a solution tank, conveyor chains extending along the sides of the tank, a work support bar resting across the chains, a work holder and an electrode hooked on the bar, and slidably connected means for maintaining the holder and the electrode at relatively different electrical potentials.

1,723,867. August 6, 1929. **Alloy for Electrical Conductors.** Michael George Korsunsky, now, by judicial change of name, Michael George Corson, Jackson Heights, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

Process of treating an alloy containing 0.5 per cent to 3.0 per cent of chromium with the balance substantially copper which comprises subjecting such alloy, in a condition wherein it has a high tensile strength, to an annealing operation in the temperature range 400° C. to 700° C. and of such regulated duration that the conductivity of the cold alloy is increased to at least 75 per cent M. S. and the tensile strength is not reduced below 70,000 pounds per square inch.

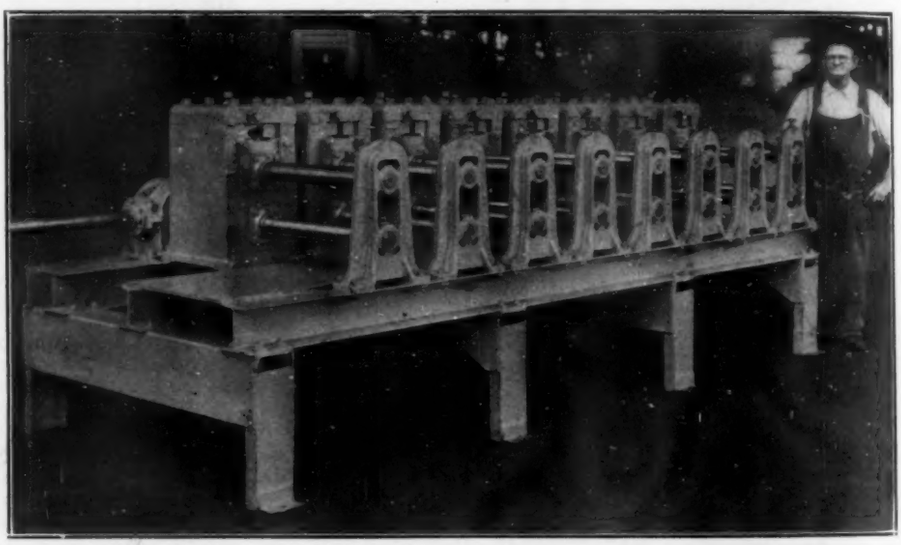
Equipment

New and Useful Devices, Machinery and Supplies of Interest

New Type Forming Mill

The Farrel-Birmingham Company of Buffalo, New York, recently completed a metal forming mill of type said to be entirely different from those which have been in use during the past twenty years. The design of the new mill conforms closely to the design of continuous mills for rolling hot bar and strip. It can be used for brass and other non-ferrous alloys, as well as for steel. Each stand is an individual unit and has an individual drive. Formerly it was the practice to drive a series of rolls through a train of spur gears which resulted in noise, vibration and surge or tramp and which was clumsy and inflexible. In this machine, it is stated, each drive uses bevel gears encased in cast iron and

The stand and the gear drive unit are fitted throughout with anti-friction bearings and are lubricated automatically. This is done to insure high efficiency, reliability and smooth silent transmission of power, the maker says. The adjustment for the top roll spindle is worthy of particular attention. Both top and bottom spindles are held rigidly to the roll housing during the rolling operation and there is therefore no backlash and wear. The top roll spindle is carried in anti-friction bearings in a single saddle and is placed against the cap by heavy springs and held in place by guide plates. The wedge, which is free to move in and out, is inserted between the top roll spindle and the housing cap.



A View of the Newly Designed Continuous Metal Forming Mill, Showing the Rolls in Series, with Separate Drive for Each Unit.

receives power from a single back shaft driven by one motor. The individual stand houses the spindle bearings, the connecting gears and the mechanism for adjusting the roll centers. It has greater strength and heavier weight than the previous designs. It provides a solid and stable installation which improves the quality and finish of the product. With the individual stand it is possible to add or subtract from the mill from time to time as different shapes of metal are formed. On heavy production work, a duplicate set of stands can be made ready so that at the finish of one production job the changeover can be immediately effected.

All materials entering into the construction of this metal forming mill have been selected with great care, the manufacturer claims. The steels are heat-treated and of alloy analysis. Semi-steel is used instead of cast iron. The Farrel-Birmingham Company specializes in the design and manufacture of machinery, and it is their claim that this new type of forming mill will give greater production with more accurate sections and a much superior finish. The flexibility of the design, it is claimed, results in considerable saving in operating costs, to which a great deal of attention has been paid by the manufacturer.

Test Pellets for Cleaning Solutions

A simple method of testing the strength and cleansing properties of a cleaner solution is marketed by the Apothecaries Hall Company, Waterbury, Conn., who state their "Ahco" cleaner pellets have been devised for the purpose. The strength of any metal cleaning solution, the makers state, can be determined by dissolving one of these pellets in a small sample of the solution. While this does not improve the solution, the makers state, it does indicate its strength and cleansing capacity to a degree making it a very practical and efficient test method for general shop work.

The company markets the pellets separately or in the form of a test set consisting of a supply of pellets and 250 c. c. beaker and glass stirring rod. This is all the apparatus needed.

"Outdoor Exposure" Lacquers

New types of lacquer finishing materials of unique character have been announced by the Zeller Lacquer Manufacturing Company, Inc., 20 East 49th Street, New York City. The new materials are to be known as "Zellac Outdoor Exposure Grades" and are described by the manufacturer as "absolutely impervious to all weather conditions." Officers of the company state that their weather exposure grades have undergone the most extended and uncompromising tests in practical finishing, and that these new lacquers have been placed in production to meet a nation-wide demand.

Many manufacturers have for years sought lacquers of this type for the finishing of products destined to serve the public

in out-of-doors utilities, it is stated. Objects of polished brass, where it is desirable to retain a high polish without frequent cleaning, present an illustration of the many articles to which such weather exposure finishing materials will come as a boon. Other metal products, and many wood products as well, the Zeller officials point out, will be definitely improved by the application of this clear nitrocellulose finish which will withstand the effects of sun, rain, wind, brine, sea-fog, snow or ice for an indefinite length of time.

Hugo Zeller, president of the company, points out that the Zeller laboratories years ago produced exposure grades, such as the well-known pigmented "Auto Zellac Top Coat Enamels," the success of which has been noteworthy to a remarkable degree. "Even our own weather grades, however," said Mr. Zeller, "have been overshadowed in point of ruggedness by the new 'Outdoor Exposure' grades. We shall go on producing all the grades we have supplied in the past, for each continues to meet the purpose it was designed to fulfill. But the new grades have proved themselves so entirely adequate when exposed to weather conditions of every kind, I am inclined to believe that they will make a reputation for themselves altogether unique in the annals of lacquer history."

The announcement describes the new materials as intended for either a clear high-gloss or clear satin finish when applied directly over wood or metal surfaces. They are made both for spray and dip application, and may be used also as a transparent top coat. A single coat is sufficient for the protection of polished or any other metal surfaces, it is claimed. For natural wood finishing, the "Outdoor Exposure" grades may be used according to the customary procedure, following the usual steps of sanding, staining, filling, sealing and wood-lacquering, with a single coat of the new material as an outside top coat.

These new materials are to be produced in standardized form as well as in modified form where required to meet special requirements when specified.

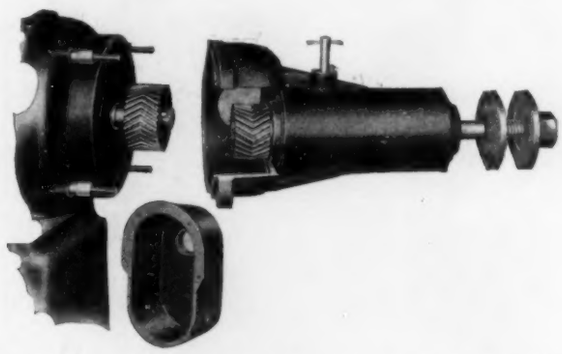
In discussing the subject of weather exposure lacquers, Mr. Zeller pointed out that the company's laboratory has worked on the problem with a great deal of concentration for several years, developing improved types step by step. "We perfected the present grades early in 1929," he said, "and demonstrated their effectiveness to our own satisfaction, both in laboratory and practical tests. However, we have withheld them until now as it is our custom to give new materials every opportunity in practical finishing demonstrations to show up any possible defects. Having made sure of our materials, we consider it is now time enough to announce them to our customers."

Herringbone Gear-Driven Polisher

A new type of gear-driven polishing lathe for which the manufacturer and distributor claim a number of distinctive advantages, has been developed by The Mitchell Engineering Company, Springfield, Ohio, and placed on the market by Frederick B. Stevens, Inc., Detroit, Mich., exclusive distributors of this equipment. The new machine is known as "The Mitchell Selective Speed Motor Driven Polishing Lathe with Herringbone Gear Drive." In a descriptive circular which is obtainable from the Stevens company, the machine is stated to have the following mechanical and operating advantages:

Above—Front View of Herringbone Gear-Driven Polisher. At Right—A Side View

Continuous tooth herringbone gears with teeth cut at 40 degree helical angles, insuring quiet operation and greatest possible tooth contact; the gears have 2 in. face width and are capable of transmitting 25 horsepower; they are said to deliver 98% of total power of motor to polishing wheels; wear reduced to minimum by extreme precision in manufacture of gears and mounting; each spindle bearing housings with spindle and bearings is a separate unit, removable without distributing motor or motor bearings; motor shaft carried in two independent ball bearings, taking strain and vibration from motor bearings and preventing injury to motor should spindle bearing wear out; driving gears keyed to motor shaft with feather key, permitting rotor to float to magnetic center; gears completely encased and run in oil; spindles can be operated at different speeds independently of each other;



View of Gear Drive and Spindle Assembly of the New Type Polishing Machine

spindles well to front of machine, putting cutting edge of machine well out in front of machine; obtainable spindle speeds are 1800, 1930, 2027, 2230, 2400, 2580, 2780, or 3000 r.p.m.

It is pointed out that power engineers recognize that the herringbone gear drive is the most efficient and noiseless power transmission mechanism, and that its embodiment in the Mitchell polishing lathe is a distinct advance in polishing practice.

Silver Solder Saves the Day

In Wisconsin an ingenious man invented a new type of electric water heater and organized a corporation for its manufacture.

The laboratory sample heater worked perfectly and a factory was leased, machines were installed and materials purchased for the production of a large number of the heaters. The first hundred

or so were sold and installed. Then leakage troubles broke out all along the line and the heaters came back.

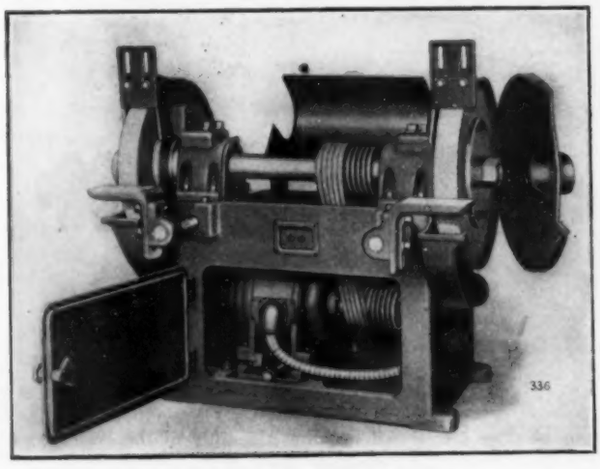
The device contained a cement core heating unit enclosed in a brass cylinder. The rapid and unequal expansion due to the fact that one side of this cylinder was still cold after the other side was heated by the energized central core, caused the cylinder to part at its head, and also certain connections to give way. They called in expert welders. They tried threading the heads. Nothing succeeded until they hit upon brazing the joints with silver solder. This material solved the problem because the ductility of the silver in the solder took care of the expansion stresses, which had been so great as to rupture both threaded and autogenous-welded joints. Thus, a few cents worth of silver solder on each $150.00 machine solved a problem which might otherwise have wrecked an ambitious manufacturer of a worthy device.

This story is told by Handy and Harman, 57 William Street, New York City, precious metals manufacturers, who publish an interesting booklet on solders called "The Handy Book of Silver Solder," sent gratis on request to the company.

High-Speed Snagging Grinder

Snagging and other grinding operations have been greatly speeded up in the constant effort to obtain high production in metal fabricating plants. The development of high speed grinding wheels of various types has, of course, aided greatly in this direction. A new high speed grinder has been placed before the public by the Hisey-Wolf Machine Company, Cincinnati, Ohio, in the form of the "Hisey High Speed TexDrive Grinding Machine" shown in the illustration.

The manufacturer claims that this grinder has been especially designed to handle high speed wheels and that in it many desirable new features have been incorporated, such as convenience of operation, strength, freedom from vibration, safety, simplicity, etc. The machines are built in single and also multi-speed types. Single speed types are of three sizes, 18, 20 and 24 inch, 5, 7½ and 10 horsepower, respectively, and having respective spindle speeds of 2000, 1800 and 1550 r.p.m. According to the maker, the single



High Speed Snagging Grinder

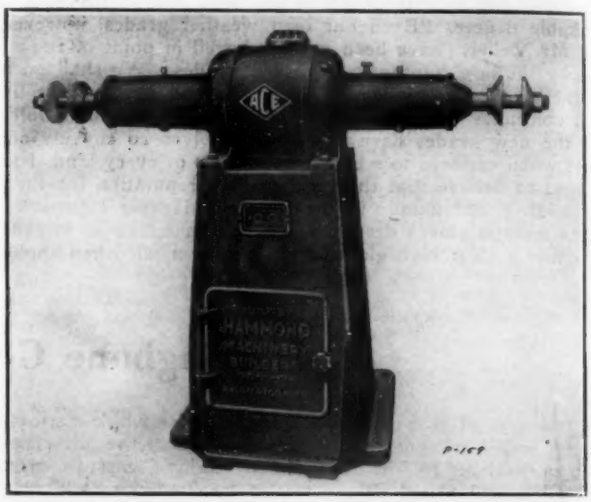
speed machines are most economically used in banks of three and multiples thereof, permitting transferring of grinding wheels to smaller diameter machines as they wear down on the larger ones. The multi-speed machine has a 10 horsepower motor and takes a 24 inch wheel which operates at 9500 surface feet per minute. When the wheel is worn down to 20 inches in diameter, the machine is speeded up to keep the surface speed equal to that of the 24-inch wheel.

Features of construction of these machines, according to the makers, include the following: horizontally mounted, ball-bearing motor; motor starter in base; boiler plate wheel guards; safety device to prevent exceeding maximum safe speed; bearing boxes keyed to column; belts quickly removed or replaced; extra large spindle; ball bearings for spindle ends; chip breaker on wheel guard; pulley hood hinged to back of column; wheel guard door overlapping the guard proper; heavy steel wheel flanges; labyrinth seal on dust covers, protecting bearings; easy lubrication; "Textrope" drive; "Flex-steel" conduits and fittings.

Heavy Duty Buffer and Polisher

A new line of heavy duty buffing and polishing machines is being placed on the market by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. (formerly the Hill-Curtis Company). These machines will be manufactured in a complete range of sizes from three to fifteen horsepower, one type being shown in the illustration. The description of this line of machines, as issued by the manufacturer, is given here:

The motor, which is a 40 degree centigrade type, is especially designed for the service. It is totally inclosed, having no holes or open slots for ventilation. Clean air is supplied to the motor



Heavy Duty Buffer and Polisher

through "Air-Clean," without piping to outside, insuring a clean, cool efficient power unit. The motor is liberally proportioned, designed to withstand the severe load to which a machine of this kind is subject. The motor will withstand a momentary overload of 100% beyond its rated capacity and without heating over 40 degrees centigrade. Push button control is conveniently mounted on the front of the pedestal with "Cutler-Hammer" automatic motor starter, having thermal overload protection, and low voltage protection conveniently mounted on the door of the pedestal.

Four oversize ball bearings support the one piece chrome-manganese steel spindle. The bearings are designed with convenient oil cup, oil level gauge and flushing plug for convenience of removing old oil and replenishing with new. Double labyrinth seals with overflow gauge prevent dirt and dust entering the bearing compartment and the oil overflow prevents surplus lubrication entering into the motor compartment. Flat top spindle thread and spindle lock are standard equipment.

The machines are regularly supplied in 220, 440 and 550 volts, 25, 50 and 60 cycle, 2 and 3 phase alternating current. Direct current machines are supplied to order. These lathes are supplied in the 3, 5, 7½, 10 and 15 H. P. capacities. The two bearing machine supplied in the 1½, 2, 3, and 5 H. P. capacity.

Spray Testing Equipment

A line of machines for salt or fresh water spray testing of metals has been introduced by the Industrial Filter and Pump Manufacturing Company, 361 West Ontario Street, Chicago, Ill. These machines are made in various sizes and are stated to conform to Bureau of Standards recommendations for testing electroplated deposits. It is also useful for testing of lacquer and paint surfaces, raw metals, etc., for their corrosion resisting properties.

These machines are made with ¼ horsepower compressor units. One type stated to be large enough for testing two automobile radiator shells or the equivalent of this in smaller articles. The testing compartment is 34 in. high, 12 in. wide and 26 in. long. Another size, for small work, is 24 in. high, 12 in. wide and 26 in. long. Sizes can be manufactured to order to meet requirements. All the machines are equipped with cabinets of Allegheny metal. The machines are made so that tests can be run over night without attention.

Equipment and Supply Catalogs

Resurfacing and Repairing Generator Commutators. Ideal Commutator Dresser Company, Sycamore, Ill.

Lathes. Monarch Machine Tool Company, Sidney, Ohio. An illustrated 20-page book with data for lathe operators.

Buffalo Wetboy Unit Heater. Buffalo Forge Company, Buffalo, N. Y. Leaflet on an air-washing and humidifying unit heater.

Non-Corrosive Welding Material. Fusion Welding Corporation, Chicago, Ill. Illustrated leaflet on Weldite Type-S Welding Rod.

Forging a Differential Side Gear. The National Machinery Company, Tiffin, Ohio. National Forging Machine Talk No. 70. Illustrated circular.

Corrosion Data. International Nickel Company, New York. A 16-page booklet giving the users of nickel and Monel metal for various process industries.

Industrial Air Heaters. Gehnrich Oven Company, Inc., Long Island City, N. Y. Air heating apparatus for low temperature industrial baking and drying operations.

Stable-Arc Welder. The Lincoln Electric Company, Cleveland, Ohio. Leaflets on this company's 300-ampere welders of various types, with complete specifications.

The Quarter Century Mark. Pangborn Corporation, Hagerstown, Md. Leaflet on the twenty-fifth anniversary of this large manufacturer of sand blasting equipment.

Spectrographic Outfits for Metallurgical Analyses. Adam Hilger, Ltd., 21 Rochester Place, Camden Road, London, N. W. 1, England. A guide to the choice of spectrographic apparatus.

Green Chain Grate Stoker. Combustion Engineering Corporation, 200 Madison Avenue, New York City. Catalog describing the Green natural draft stoker for steam boilers. Illustrated.

The Handy Book of Silver Solders. Handy and Harman, 57 William Street, New York City. Illustrated booklet on hard soldering, explaining uses of silver solders and methods of application.

Airplane Fuselage Welding. The Linde Air Products Company, 30 East 42nd Street, New York City. Illustrated 12-page pamphlet outlining a course in welding duralumin and other light alloys used in aircraft.

The Fuerst-Friedman Company, 1292 East 53rd Street, Cleveland, Ohio. **Bulletin 37,** a catalog of motors, generators, grinders, compressors pumps cranes and miscellaneous other rebuilt machinery. Forty-eight pages illustrated.

Horse Head Zinc in Die Castings. The New Jersey Zinc Company, 160 Front Street, New York City. Admirably illustrated booklet showing many examples of die cast products and explaining the use of zinc and zinc alloys in them.

The Ferro Enamel Supply Company, Cleveland, Ohio, offers the following, gratis: "Brushings," a monthly organ edited by William Feather; "Burning Facts," "Where One Outweighs Ten," "Saving $80 a Day," and "When the Committee Decides."

Standardized Buffing Compositions. Frederic B. Stevens, Inc., Detroit, Mich. Pamphlet on a variety of compositions for chromium plate and other metallic finishes. Also, "Doctor Stevens Emergency Service," leaflet on plumbago, core compounds and wash, etc.

Finishing by the Dry Method. Lea Manufacturing Company, Waterbury, Conn. This booklet giving complete data, with illustrations, describes the use of greaseless compound for producing brush brass satin, Colonial and other finishes directly from the wheel.

General Electric Company, Schenectady, N. Y., publications: Electric Gasoline Gauge for Aircraft; List of Buildings and Bridges Constructed by Welding Steel; Constant-Potential Arc-Welding Sets; Pressure Governor; Motor Controllers; Automatic Welding Head and Control Magnetic Controllers; Conveyor Furnace Type RRT, with mesh belt, for quantity heat treatment of small parts at temperatures up to 1650° F.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILLINOIS

Non-Ferrous Shop Operation Course

At the coming annual convention of the American Foundrymen's Association, to be held in Cleveland, May 12th to 16th, 1930, there will be given a Non-Ferrous Shop Operation Course for the brass foundrymen along the lines of that given in recent years for the grey iron interests.

The subjects dealt with will include crucible open fire and electric furnace melting practice. The matter of gating will be discussed as well as the effect of pouring temperatures and pouring practice.

The course will be held at 4:00 P.M. during the days of the meeting and each subject will be in the hands of a leader who is an authority on the particular phase of brass foundry practice.

The Non-Ferrous Shop Operation Course is in charge of a committee of which W. F. Graham is chairman. He can be addressed at The Ohio Brass Company, Mansfield, Ohio.

Nominating Committee Complete

The 1930 Nominating Committee was completed recently with the election of four members by a letter ballot of the Association membership, returned November 4. Election judges canvassed 816 votes, declaring the following elected to the committee:

M. J. Evans, vice-president, Whiting Corporation, Harvey, Ill.

R. J. Doty, plant manager, Reading Steel Casting Company, Reading Pa.

Wm. J. Grede, president, Liberty Foundry, Inc., Milwaukee, Wis.

T. H. Addie, president, American Manganese Bronze Company, Philadelphia, Pa.

In addition to four members elected annually, the By-Laws of the Association also provide that the Nominating Committee shall include the last three living past-presidents of the A.F.A. The past-presidents thus automatically members of the 1930 committee are A. B. Root, Jr., Hunt-Spiller Manufacturing Corporation, Boston, senior past-president and chairman of the committee; S. W. Utley, Detroit Steel Casting Company, Detroit; and S. T. Johnston, S. Obermayer Company, Chicago.

A meeting of the 1930 Nominating Committee will be held shortly after the first of the year to consider suggestions from members of the Association as to candidates for officers and directors.

Study Liquid Shrinkage

Progress in the investigation of the problem of liquid shrinkage, being carried on through the co-operation of the American Foundrymen's Association and the Bureau of Standards, is indicated in a report submitted by E. J. Asb, research associate

for both organizations, to the committee on cast iron of the American Foundrymen's Association.

The first investigations were carried out on cone-shape specimens cast in dry-sand molds. The external pipe and internal voids were determined by weighing, filling the pipes with wax, and calculating the volumes. However, true shrinkage values could not be obtained due to non-uniformity of metal temperature, and because a volume change takes place in some of the metal during the casting period.

Consequently, a new procedure was developed which is termed the crucible immersion method. This consists in immersing a crucible of known volume into a ladle of molten metal and filling the cavity of the crucible, allowing sufficient time for the crucible and the metal to reach a temperature equilibrium. When this state is attained a lid is pressed down firmly on the crucible and the whole removed from the melt. After cooling, the resultant ingot is weighed, and through the known volume of the crucible, the specific volume value of the metal at the temperature of sampling may be determined. Results obtained with 98.5 per cent aluminum show a solidification shrinkage, based on liquid volume at 656 degrees Cent., of 6.4 per cent. This method only can be used to collect data for constructing the specific volume curve of the liquid metal. Also it will be possible to express the relative tendency of metals to distribute their solidification shrinkage between external pipe and internal voids. This distribution may be largely a function of the quantity of the heat contained in the lid which acts as a hot top. Similar data will be obtained for zinc, No. 12 aluminum alloy, lead and probably the 85-5-5-5 brass. Following these the work will continue in collecting data on cast iron.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Bridgeport Branch

HEADQUARTERS, CARE OF WILLIAM EHRENCRONA, R. F. D. NO. 1, BRIDGEPORT, CONNECTICUT

"Old-Timers' Night"

The Bridgeport Branch, American Electroplaters' Society, held "Old-Timers Night" on Friday evening, November 15, at the office of the Contract Plating Company, Bridgeport. The meeting was turned over by President Waystaff to Chairman Chamberlain of the Progress Committee. Due to the fact that the Newark Branch was holding its regular meeting the same night, Horace Smith, Supreme President, Oliver J. Sizelove and Philip Sievering, members of that branch, were unable to attend as had been expected. R. J. O'Connor read a letter expressing their regret at their inability to attend.

The first speaker of the evening was Mr. Cassell, of the Udylite Company, who spoke on "Cadmium Plating." The talk was very practical and conveyed much valuable information. He explained the discovery of "Udylite," its applications, and discussed the corrosion resisting properties of cadmium.

"Polishing of Stainless Steel" was the subject of a talk by Mr. Brown of the Norton Company, Worcester, Mass. This paper also contained a great deal of useful data, covering set-up of polishing wheels and the operations necessary for complete finishing of stainless steel.

After the chief speakers were through, the chairman called upon a number of the older members of the Branch to relate some of their experiences.

Refreshments were served after the speaking, the party breaking up at a very late hour. R. J. O'Connor.

Chicago Branch

HEADQUARTERS, CARE OF J. C. KRETSCHMER, 1914 WARNER AVENUE, CHICAGO, ILLINOIS

Annual Banquet January 18

The Chicago Branch of the American Electroplaters' Society will hold its annual banquet on Saturday evening, January 18, 1930. The affair will take place in the Red Lacquer Room of the Palmer House, Chicago. During the afternoon the annual meeting and educational session will take place.

Los Angeles Branch

HEADQUARTERS, CARE OF M. D. RYNKOFS, 1354 WEST 25TH STREET, LOS ANGELES, CALIFORNIA

Regular meeting was held on the second Wednesday in November at the Y. M. C. A. Hall, President C. E. Thornton presiding and all officers present. Thirty-seven sat down to dinner at 6:30 p. m. The business session was exceptionally long, and very little time was spent on the educational discussions.

L. Riess, of the Philadelphia Branch, Robert Gripp, our first president, and Mr. Blum of San Francisco were present, all three giving us interesting talks.

A motion that the Los Angeles Branch donate $50 this year to the Research Committee was carried.

The question box contained a number of questions which were satisfactorily answered.

Charles Russill promised to get in touch with members of the Los Angeles Board of Education to see if arrangements could be made for a chemistry class in one of the schools.

We urge all of the members and applicants to be present at the next meeting, which will be held in the Y. M. C. A. Hall, Los Angeles, on December 11, at 6:30 p. m.

M. D. Rynkofs.

Philadelphia Branch

HEADQUARTERS, CARE OF PHILIP UHL, 2432 NORTH 29TH STREET, PHILADELPHIA

Annual Meeting and Banquet

The annual banquet and open meeting of the Philadelphia Branch of the American Electroplaters' Society was held on November 23rd at McAllister's Hall, Philadelphia.

The Educational Session was opened at 3 P. M., with Dr. Hiram Lukens of the University of Pennsylvania as chairman. A comprehensive program included papers on a variety of subjects and of the very highest grade.

After the opening speech, in which Charles H. Proctor discussed how the branches of the Society could best further its interests and their own, a paper was read by Clayton M. Hoff of the Grasselli Chemical Company, Cleveland, on Cadmium Plating. Mr. Hoff traced the history and growth of the industry pointing out that in ten years the use of cadmium for electroplating had grown to a magnitude of 100,000 pounds per month. Cadmium is used in a wide variety of work, but particularly for rust protection. Mr. Hoff described the composition of cadmium baths, the formation and removal of carbonates from the solutions, the proper shapes for anodes, methods of determining the size of the equipment, calculations of costs and commercial constituents involved.

Norman Gebert of the American Chain Company, York, Pa., described the improved corrosion tests of electro-deposited metals as carried on in his plant. All nickel plated work is subjected to the ferroxyl tests for two hours for porosity of plating of nickel on steel or brass. For a brief description of the apparatus used in this test, see The Metal Industry for July, 1929, page 349.

Dr. Blum of the Bureau of Standards, Washington, D. C., spoke on throwing power in chromium plating, basing his talk on the report of H. L. Farber, research associate of the American Electroplaters' Society at the Bureau, on the research work which he had been doing. Through this work a method was developed of giving numerical value to throwing power, which would check the practical results obtained. The details

of this investigation will be published in the near future as a research paper of the Bureau of Standards.

Dr. Graham of the University of Pennsylvania spoke on the Control of Hydrogen Ion Concentration in Solutions for Nickel Deposition, recommending the testing and correction of nickel solutions by titration analysis rather than the colorimetric method of determining the pH, in order to eliminate the cut and dried procedure necessary to bring solutions to the proper acidity.

The last part of the meeting was devoted to the question box period, in charge of George B. Hogaboom of the Hanson Van Winkle Munning Company, Matawan, N. J. A variety of questions were asked and answered in this period by Mr. Hogaboom and various members on the floor.

The banquet was held at 7 P. M. and was a gay affair. It was followed by an unusually entertaining vaudeville show and a dance.

The outstanding social feature of the meeting was the presentation to George Gehling of a diploma giving a vote of thanks of the Philadelphia Branch to him for his earnest and capable efforts for eight years on behalf of that Branch and electing him to honorary membership therein. It was a signal honor to one of the most popular members of the Society and fully deserved in every way.

A number of attractive souvenirs were distributed and prizes given by the electroplating supply houses. It is safe to say that every one of the 400 members and guests who attended the meeting and banquet had a most enjoyable and worthwhile day.

International Fellowship Club

HEADQUARTERS, CARE OF T. A TRUMBOUR, BOX 183, WALL STREET STATION, NEW YORK CITY

Dinner at Chicago, January 18

The annual Good Fellowship Dinner of the International Fellowship Club will take place in private dining room No. 9, Palmer House Hotel, Saturday, January 18, 1930, during the annual meeting of the Chicago Branch of the American Electroplaters' Society, which takes place at the Palmer House the same date.

There will be several speakers at the dinner.

Lighting Equipment Association

HEADQUARTERS, GRAYBAR BUILDING, LEXINGTON AVE., NEW YORK CITY

Washington Chosen for Convention

The 1930 convention and fixture market of the Artistic Lighting Equipment Association, the national association of lighting fixture manufacturers and dealers, will be held in Washington, D. C., February 9 to 15, 1930.

The fixture market—which is the style show of the lighting equipment industry—will be held in the Auditorium, located in the heart of the city, three blocks from the White House. This building provides the largest exhibit space available in Washington. The business sessions and social events of the convention will be held in the ball-room, the Chinese room and the Pan-American room of the Mayflower, one of Washington's finest hotels, which is a short distance from the Auditorium.

American Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

New York Section Meets

The New York Section of the American Electrochemical Society held its fall meeting November 22 at the Chemists' Club, New York City. There was a dinner preceding the meeting.

C. E. McQuigg, head of the Union Carbide and Carbon Research Laboratories, was the principal speaker. He discussed the fundamentals of corrosion, primarily from the viewpoint of the metallurgist. His talk was supplemented by discussion of the subject by some of the members in attendance.

National Founders Association

HEADQUARTERS, 29 SOUTH LA SALLE STREET, CHICAGO, ILLINOIS

Thirty-Third Annual Convention

The National Founders' Association held its thirty-third annual convention at the Hotel Astor, November 20 and 21, 1929. After reports of various committees, the convention heard addresses as follows:

"The Legislative Situation," W. G. Merritt, associate counsel, League for Industrial Rights; "Finance," F. F. Winans, New York City; "Third International Foundrymen's Congress," S. W. Utley, American Foundrymen's Association, Chicago, Ill.; "Business Policies and Business Information," R. P. Falkner, chief statistician, National Industrial Conference Board; "Seven Years' Foundry Improvement," D. R. Wilson, chairman, Committee on Foundry Methods; "Changing Ideas of Control," Elton Mayo, Professor of Industrial Research, Harvard University, Cambridge, Mass.

The convention dinner was held on the evening of November 20, with Thomas S. Hammon as toastmaster. E. H. Sothern gave an address on "Reminiscences of the Stage." The convention breakfast was held at 8 A. M., November 21. It was followed by a discussion of foundry costs, with John L. Carter, chairman of the foundry costs committee, presiding.

The officers of the Association for the coming year were elected as follows: President, Thomas F. Hammond, Whiting Corporation, Detroit, Mich., re-elected; Vice-president, F. Wells Utley, Detroit Steel Casting Company, Detroit, Mich.

Personals

L. C. Pan

Dr. Li Chi Pan, who is giving the course in practical electroplating at the College of the City of New York, was born on November 6, 1897, in Soochow, China, and was educated there. His keen interest in chemistry started early in his grammar school years. Since grammar school then did not teach much of chemistry, he took extra chemistry lessons outside of school hours under a young tutor who inspired much of his love of chemistry. When he entered Soochow University, his efforts were at once concentrated on Chemistry. After his graduation as B.S. in 1919, he declined offers of lucrative positions in order to pursue further knowledge of that branch of science.

During the years 1919-1921, he assisted in teaching chemistry in order to enable himself to carry on research in the chemical field. In 1921, Soochow University conferred on him the degree of Master of Arts in chemistry. In the same year, he won the Tsing Hwa Fellowship through a competitive examination. With this fellowship, Dr. Pan came to this country in 1921. He spent three years here studying chemical engineering in general and applied electrochemistry in particular, at Columbia University in New York City, under the inspiring guidance of Prof. Colin G. Fink. Dr. Pan received his degree of chemical engineer in 1924, and Ph.D. in 1926, from Columbia. Since 1924, Dr. Pan has been associated with Prof. Fink in research in the field of electrochemistry and electrodeposition of metals. During 1925 and 1926 he was employed as a chemical

Dr. Li Chi Pan

engineer by the Chromium Corporation of America. At the old Centre St. plant of that company, he developed a process of chromium plating marine fixtures which were to be subjected to the most severe service conditions. His corrosion testing machine, on account of the reproducible results obtainable, is now being used in several large laboratories throughout the eastern part of the country, where extensive corrosion tests are being made daily. This machine is especially valuable for testing in all kinds of mediums at various temperatures, not only metals and metallic coatings, but also non-metallic materials and coatings.

Since 1925, Dr. Pan has been in constant contact with platers eager to know the science of electroplating. With the conviction that an evening course in scientific electroplating would greatly help the electroplaters, Dr. Pan decided that he would give the course. However, it took him three years to make this dream a reality and he says it is largely due to the whole-hearted support of Prof. Fink that arrangements were finally made with the College of the City of New York to have the evening course in electroplating given under its Chemistry Department. In 1928 the class was started and since then platers have enrolled each term to the full capacity of the class-room and laboratory.

Dr. Pan's "Simplified Methods of Chemical Control" and analysis charts, published last June, stirred up much interest among the platers. With a view of rendering a greater service to the electroplaters, Dr. Pan has recently identified himself with Chromium Service and Sales, Inc., of Long Island City, N. Y., an organization of which he is vice-president and technical director. This organization, under Dr. Pan's supervision, has installed a fully equipped electrochemical and metallurgical laboratory where all electroplating problems of general interest can be brought. Through this organization Dr. Pan is now preparing standardized reagents for distribution among electroplaters and electrotypers for the chemical control of plating solutions.

Lester Hudson has left the company's enamel service department to take charge of porcelain enameling operations at the Emerson-Brantingham Corporation, Rockford, Ill.

Alexander F. Jenkins, president and treasurer of the Alexander Milburn Company, Baltimore, Md., manufacturers of welding supplies and equipment, is in Europe for a tour and will probably remain away until about the first of the new year.

Conrad W. Given has been made Western Pennsylvania-Detroit service manager for The Ferro Enamel Supply Company. His quarters are in Erie, Pa. Mr. Given is a graduate of Iowa State University and was for a number of years associated with The Chattanooga Stamping and Enameling Company, Chattanooga, Tenn.

D. O. Reardon is now representing the Wagner Electric Corporation of St. Louis, Missouri, in 64 counties in Iowa, with headquarters in Des Moines. Mr. Reardon was for the past seven years Iowa representative for the merchandising division of the Westinghouse Electric and Manufacturing Company. Prior to that he was a maintenance foreman for the Bell Telephone Company at Chicago, and spent several years in the maintenance department of the Commonwealth Edison Company. He was born and reared in Chicago and is a graduate of De Paul University.

Frank E. Richardson has resigned as vice-president, in charge of sales, of National Chromium Corporation, New York City, and is now associated with Weisberg and Greenwald, New York City, consulting chemical engineers. Mr. Richardson will be concerned particularly with chromium plating installation sales for Weisberg and Greenwald. He has been associated with the metal industries for the last fifteen years, and is now chairman of the board for Metals Processes Corporation, in addition to his connection with Weisberg and Greenwald.

The Ferro Enamel Supply Company, Cleveland, Ohio, announces that **Jack Abbott,** furnace builder, specializing in porcelain enameling installations for The Ferro Enameling Company of Canada, Ltd., has been transferred to the furnace building staff of The Ferro Enamel Supply Company, Cleveland, Ohio. **J. R. Burt** has left the company to take charge of the new enamel plant at the Mullins Manufacturing Corporation, Salem, Ohio. **Thomas Morris** is now working under the Cushman Research Fellowship at Western Reserve University, Cleveland, Ohio. He succeeds **Royal Bryant,** who is now studying under a Rhodes Scholarship at Oxford. The Cushman Research Fellowship was founded several years ago by H. D. Cushman, president of The Ferro Enameling Company, for the investigation of fundamental chemical reactions of vitreous (silicate) enamels. Previous to receiving the Fellowship, Mr. Morris was chemist for the Brown Company, Berlin, New Hampshire. He is a graduate of Brown University.

Obituaries

Parker D. Handy

Parker Douglas Handy, chairman of the board of directors of Handy and Harman, New York City, dealers in and refiners of gold, silver and platinum, passed away November 12th, 1929, after a brief illness.

Mr. Handy was born in Fairfield, Conn., on August 12, 1858, and after attending the public schools went to Princeton University. He has always maintained a deep interest in the affairs of Princeton, and became a life trustee of the University in 1910. He also served on the finance committee, of which he was chairman for a time; and for a number of years was president of the Princeton Club of New York City.

After graduating from Princeton, Mr. Handy was engaged in the South American export trade. In 1887 he became a member of the firm of Handy and Harman, joining with his father and John F. Harman, at present vice-chairman of the board of directors of Handy and Harman. Mr. Handy was elected president when the firm was incorporated in 1905. He remained at the head of the company until 1927, at which time he retired from active management to become chairman of the board of directors.

Mr. Handy was a director of the City Bank Farmers' Trust Company, and had served in the Seventh Regiment for five years. From 1905 to 1909, he was a trustee of the College of the City of New York. He was also a member of the Society of the Cincinnati, the Sons of the Revolution, the Downtown Association, the New York Chamber of Commerce and the University, Princeton, Nassau Country and Piping Rock Clubs. His home was at 44 East 74th Street, New York City.

He is survived by his widow, two sons, Cortlandt W. Handy, president of Handy and Harman, and Truman P. Handy; a daughter, Mrs. Ford Burchill; and a sister, Miss Cornelia S. Handy.

Parker D. Handy

Charles S. L. Trench

Charles S. Le Poer Trench, editor of "The American Metal Market" and senior partner in Charles S. Trench and Company, New York City, metal merchants, president of the British Empire Chamber of Commerce for the last three years, died on November 8, 1929 in St. John's Hospital, Brooklyn, N. Y., after a brief illness, in his seventy-fifth year.

A native of Stradbroke, England, Mr. Trench came to New York as a young man and entered the employ of White and Haskell, metal brokers. In 1881 he established his own firm and for the last forty years had been an important figure in the metal trade.

During the World War, Mr. Trench was chairman of the British Red Cross and later was active in the affairs of the British Great War Veterans. He was chosen president of the British Empire Chamber of Commerce in 1927 and was twice re-elected. His clubs included the Canadian, India House, Richmond County Country, Oak Bluffs Country and the British Schools and Universities Club.

Charles S. L. Trench

He left two sons, C. S. J. and S. P. Trench, associated with him in business; two daughters, Mrs. F. E. Ferris of New Brighton, S. I., and Mrs. W. Arthur Ross of Oxton, England, and two brothers, William P. Trench of Brooklyn and S. A. Trench of Jersey City. His home was in New Brighton, Staten Island, N. Y.

A. Herman Wirz

A. Herman Wirz, president and treasurer of A. H. Wirz, Inc., Chester, Pa., died of pneumonia on November 22, 1929, in his forty-second year.

The company which Mr. Wirz headed is one of the oldest manufacturers of collapsible tubes and sprinkler tops in this country. It was founded by his great-grandfather in 1836 as a metal specialties manufactory. In 1880 the company started to make collapsible tubes on a small scale at Philadelphia, where it was then located. This branch of the business grew steadily until it became the firm's chief product. The plant was moved to Chester in 1914.

August Goertz

August Goertz, founder of the August Goertz Company, Newark, N. J., metal novelty manufacturers, died November 24, 1929, at his home, 793 High Street, Newark. He was in his eighty-fourth year. Mr. Goertz, who was a native of Germany, came here in 1866. Besides his activity in the company bearing his name, he was very active in financial and social affairs in Newark. He is survived by his widow, three sons and two daughters.

Leonard S. Austin

Leonard S. Austin, widely known metallurgist, chemist and scientific author, died on October 29, 1929, at his home in Los Angeles, Calif., in his eighty-third year.

Professor Austin, author of more than a score of scientific works, was born at Stratford, Conn., in 1846. In 1868 he graduated from the Sheffield Scientific School, New Haven, and went to Yale, Columbia and the Colorado State School of Mines for post-graduate work. Until 1877 he was engaged in mechanical engineering. He then became a chemist for the Exploration Company, on the east coast of Patagonia, in South America.

Mr. Austin was chemist and foreman for the Germania Lead Works from 1880 to 1886 and was superintendent of various smelting works in this country until 1902. In 1903 he became professor of metallurgy and ore-dressing at the Michigan College of Mines, where he remained until 1909. He was a member of several mining and metallurgical societies. One of his best known books is "Metallurgy of Common Metals," the fifth edition of which was published in 1920.

Claude Vernon Marks

Claude Vernon Marks, secretary-treasurer of the Ohio Brass Company, Mansfield, Ohio, was lost at sea from the liner "Homeric" during the night of September 9, 1929, while on a business trip to Europe with C. K. King.

Born in Loudonville, Ohio, in 1882, his first business connections was with a Mansfield, Ohio, bank, which later became The Farmers' Savings and Trust Company, where he made rapid advancement to the position of branch manager. Later, at the advice of B. F. McLean, he entered the Ohio Brass Company as private secretary to A. L. Wilkinson. After an absence of about two years due to poor health, he returned and was made cashier of the company, following which he held positions of auditor and treasurer and, at the death of Harry L. Brown, he assumed the additional duties of secretary.

John Koenig

John Koenig, widely known as the father of the American aluminum industry, who founded the Aluminum Goods Manufacturing Company, Manitowoc, Wis., died there on November 15, 1929, following a week's illness.

The company which Mr. Koenig founded was one of the largest of its kind in the world. It has three large plants at Manitowoc and Three Rivers, Wis. Mr. Koenig served as vice-president of the company until a week before he died. He was principal owner of the Metalware Corporation, Two Rivers, Wis., of which his son, Remus, is president.

Mr. Koenig came to this country from Hesse, Germany, in his early twenties. Besides his son, he is survived by his widow and a daughter.

Horace Willoughby

Horace Willoughby, president of the Crane Company, Chicago, Ill., valve and pipe fitting manufacturers, died recently following an illness that lasted over a period of two years. Mr. Willoughby was in his fifty-eighth year. He was also secretary of the National Pipe and Supply Company and well known in the plumbing materials industry.

W. E. Gerlinger

W. E. Gerlinger, president of the Gerlinger Aluminum and Brass Foundry Company, Milwaukee, Wis., died at his home there on November 3, 1929. He was 55 years of age. Mr. Gerlinger founded the Electric Steel Casting Company, Milwaukee, in 1902, but withdrew from that company some years ago.

News of the Industry

Industrial and Financial Events

Revere Copper and Brass Incorporated

As briefly stated in our last issue, Barton Haselton, chairman, and George H. Allen, president of Republic Brass Corporation, New York, operating twenty-five percent of the country's copper, brass and bronze rolling mill facilities, announced on November 1st, that at a special stockholders' meeting it was voted to change the name of the corporation to Revere Copper and Brass Incorporated, effective November 12th. The change has been made to perpetuate the name of Paul Revere in the business which he founded in 1801.

Revere established the first copper rolling mill in the United States, now represented by the Taunton-New Bedford Copper Company, a division of Revere Copper and Brass Incorporated, through which Paul Revere's early copper business has directly descended and of which E. H. R. Revere, great grandson of Paul Revere, is executive chairman. The Taunton-New Bedford Company was one of six copper, brass and bronze companies which less than a year ago were consolidated as the Republic Brass Corporation.

No new changes in policies were announced. The six companies consolidated as the Republic Brass Corporation, will continue to function as heretofore with the same executive personnel. They are Baltimore Copper Mills, Baltimore, Md.; Dallas Brass and Copper Company, Chicago, Ill.; Higgins Brass and Manufacturing Company, Detroit, Mich.; Michigan Copper and Brass Company, Detroit, Mich.; Rome Brass and Copper Company, Rome, N. Y.; and Taunton-New Bedford Copper Company, Taunton and New Bedford, Mass.

The executive personnel of the parent company remains unchanged, Mr. Allen announced. Barton Haselton is chairman of the board; Francis H. Brownell, chairman of the executive committee; George H. Allen, president; C. D. Dallas, first vice-president; J. J. Russell, treasurer; and Leslie A. Wiggins, secretary.

The board of directors of Revere Copper and Brass Incorporated, it was stated in the announcement today are: George A. Allen, C. S. Mott, Walter C. Baylies, W. H. Pierce, Edward H. R. Revere, Francis H. Brownell, Walter P. Chrysler, Walter Robbins, C. D. Dallas, J. J. Russell, J. L. Dryden, Alfred P. Sloan, Jr., H. T. Dyett, Roger W. Straus, Samuel L. Fuller, L. A. Wiggins, Barton Haselton, H. D. Wolfe.

"New historical information proves beyond question," Mr. Allen said, "that Paul Revere was the first American to roll copper in 1801 and that the present company now to bear his name goes back for its origin to him as its founder. Paul Revere not only was the first American, but was one of the first men in the world to roll copper. His firm of Revere and Son, was the first of American copper rolling companies. Revere and Son in 1828, after taking over another firm devoted to manufacturing brass, was re-chartered as the Revere Copper Company, which thrived as a separate entity until 1900 and has continued to date as part of the Taunton-New Bedford Copper Company, one of the divisions of the present Revere Copper and Brass Incorporated. Not only is the Taunton-New Bedford Division of the present Revere Copper and Brass Incorporated, dating back as it does to 1801, the oldest company in America in point of manufacturing copper, but the Baltimore Copper Mills, another division, founded in 1814, is the second oldest copper mill in the United States.

"The products manufactured by the six divisions of Revere Copper and Brass Incorporated run the entire gamut of the copper and brass industry. The Baltimore plant is the largest producer of sheet, strip and roll copper in the United States. Our Chicago rolling mill, built since 1925, and its auxiliary manufacturing departments are thoroughly modern and have been designed and developed to supply middle western industry. Our New England plants, located in Taunton and New Bedford, Mass., produce not only the staple lines of copper and brass, but are long experienced in production of special bronzes and alloys used in engineering and architectural work. The Rome plant turns out a complete line of copper and brass goods in all forms of sheets, strips, bars, rods and tubes. Prior to the consolidation this plant was individually the fourth largest in the country. Our Detroit plants specialize in the production of automotive material, including sheet and strip copper, brass and bronze sheets and rods, and are especially organized to serve the particular needs of that progressive industry."

Oakite Products Annual Conference

The 110 district managers and representatives comprising the field organization of Oakite Products, Inc., New York City, met in the general offices in New York from November 20th to 23rd, on the occasion of their twenty-first annual sales conference.

Every section of the United States and Canada was represented by this organization, so that the daily discussions covered every kind of cleaning work. Among the papers read were those referring to Paint Removing, Cleaning in the Dairy Industries, Cleaning Steel for Porcelain Enameling, Cleaning Oil Tank Cars, Selling to Bottlers, Servicing Automobiles and Busses, Hotel Cleanliness, Cleaning Service for Railroads, as well as detailed discussions and practical working tests on laundry and textile problems. There was opportunity for exchange of ideas on all subjects relating to cleaning, which was augmented by special laboratory demonstrations made by the technical and laboratory staff, as well as by men who have made certain fields their special study.

Oakite Products, Inc., holds a similar conference every year to acquaint each of its men with improvements in cleaning equipment and cleaning methods.

The conference was culminated by the annual dinner, at which there were about 350 officials, employees and friends of the company. This was held at the Hotel Pennsylvania, in the form of the "Oakite Overland Special," with everyone impersonating a railroad man through the aid of rough shirts and engineer's caps furnished to all guests. The dinner was enlivened by music by the Oakite Radio Orchestra, which was present at the dinner. There were after-dinner speeches by D. C. Smith, who gave reminiscences of his early days with Luther Burbank, the great plant wizard, and D. C. Ball, president of the company, who discussed various topics, including red neckties and the benefits of work to mankind. He delivered a poem on tthe latter subject in a very forceful and completely effective manner. A good vaudeville show completed the evening's entertainment.

It was announced at the dinner that the Rochester (Empire State) division led all of the company's sales sections in the drive for new business just completed. This division was headed by H. C. Bernard, Rochester Divisional Manager.

New Chromite Source Located

A new and important source of chromite has been located about 30 miles west of Lake Nipigon, not far from the main line of the Canadian National Railways, in Canada. According to published reports, this is claimed to be the largest chromite deposit yet discovered in the western hemisphere. The discovery was announced in connection with the incorporation of the Consolidated Chromium Corporation in Delaware, with $12,500,000 of Class A and $1,500,000 of Class B shares. The company was formed by the Golden Centre Mines, Inc., and Charles V. Bob and Company, New York City.

Chromite ore is the raw material for the manufacture of chromium and chromium salts and other derivatives, which are important to the alloy steel and the plating industries.

Charles F. L'Hommedieu and Sons Company Build New West Coast Plant

The Chas. F. L'Hommedieu and Sons Company of Chicago, Ill., manufacturers of plating and polishing supplies and equipment, have completed a new branch warehouse and light manufacturing plant at East Los Angeles, Calif., in order to accommodate their increased number of Pacific Coast customers. The new plant, shown in the illustration here, has grounds 150 by 200 ft., at 6060 Ferguson Drive. It is equipped with switch-track facilities connecting with the Union Pacific Railroad. A large stock of platers' and polishers' supplies and machinery is carried at the Los Angeles branch, according to the L'Hommedieu company.

Brass Ingot Statistics

On November 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., amounted to a total of 12,735 net tons, according to an announcement of the Institute.

The average prices per pound received on commercial grades of the six principal mixtures of ingot brass, during the twenty-eight-day period ending November 8th, were as below. (As there are, as yet, no generally accepted specifications for ingot brass, it must be understood that each item listed below is a compilation representing numerous sales of metal known to the trade, by the designation shown but each item, in reality, including many variations in formulas.)

Commercial 80-10-10 (1% impurities)	17.105c
Commercial 78% metal	14.814c
Commercial 81% metal	15.483c
Commercial 83% metal	15.795c
Commercial 85-5-5-5	15.936c
Commercial No. 1 yellow brass ingot	12.739c

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for the month of October, 1929, amounted to a total of 7,726 tons.

Yale and Towne Buys British Firm

The Yale and Towne Manufacturing Company has acquired H. and T. Vaughn, Ltd., a British concern, it was disclosed through an application to list on the New York Stock Exchange the 19,400 shares of Yale and Towne stock, which was used in the acquisition of the English company. The listing of the shares was approved by the Exchange.

The property of H. and T. Vaughn consists of a manufacturing plant in Willenhall, England, and a warehouse in London. In addition to the business in the British Isles its business extends largely throughout the colonies. For the year ended on June 30, 1929, it reported net profits of $152,149, against $124,480 in the previous twelve months. The business was established in 1850.

The Yale and Towne Manufacturing Company for the quarter ended September 30, reported net income of $589,464 after depreciation and Federal taxes. This compares with $619,209 in the preceding quarter and $343,939 in the third quarter of 1928. Net income for the first nine months of the current year totaled $1,782,527 after the above charges, comparing with $1,168,818 in the first nine months of 1928.

The Zapon Company

The Cleveland branch of The Zapon Company, Stamford, Conn., has just completed a new modern office building on its property at 8810-12-14 Bessemer Avenue, Cleveland. The space formerly occupied by the office in the general warehouse will be converted into a laboratory for developing new lacquer enamel finishes and a spray room for the convenience of the trade. The branch is in charge of W. J. Terpenny, pioneer in the lacquer industry.

Waukegan Chemical Company Expansion

The Waukegan Chemical Company, Waukegan, Ill., manufacturers of lacquers, solvents, etc., has under way the construction of a new 4-story plant addition which will cost in the neighborhood of $85,000 and will be complete about February 1, 1930, according to Casper Apeland, president of the company. The new building has been designed after a thorough study of the country's large and modern lacquer plants; it is to be one of the most efficient units of its kind, according to the announcement.

The building is to cover a ground area of 50 by 100 feet and will be of fireproof brick and steel construction. The company's present plant is being entirely remodeled for use as an office, laboratory, recreation room and shipping department. Straight-line production will be carried on in the new plant. There will be eight 10,000-gallon storage tanks underground for raw materials, each equipped with pump system. "That we heartily indorse the prevailing optimism as to the business situation is concretely indicated by this new expansion to care for our rapidly increasing business," President Apeland said.

Ohio Brass Company Shipments Heavy

The Ohio Brass Company, Mansfield, Ohio, according to press reports, shipped a record amount of products from its plants during the month of October. The quantity is stated to have exceeded the August shipments and set a new high record for any one month in the firm's history. It was stated, also, that the company has its most prosperous year in prospect, inasmuch as third quarter figures show a sizable increase in net profits above those for 1927, the previous best year. Net profits for the nine months period amount to $2,104,670, or $5.80 per share, on the common stock after preferred dividends and Federal taxes, while comparable figures for 1927 show net profits of $1,883,235, or $5.14 per share

International Nickel Company of Canada

The International Nickel Company of Canada, Ltd., Copper Cliff, Ont., reported for the third quarter of 1929 a net operating income of $6,785,206 as against $6,675,642 for the preceding three months. For the first nine months of 1929 the net operating income was $20,045,130 as against $9,902,223 in the corresponding period of 1928. In all except the last mentioned figure the figures for the Mond Nickel Company, Ltd., are included. Profits for the third quarter of 1929 were $5,627,577 against $5,647,984 in the previous quarter; for the first nine months profits, including those of the Mond company, were $16,865,753, as against $8,304,771 in the same 1928 period but not including the Mond figure.

Doehler Die Casting Company

Doehler Die Casting Company, New York, reports for the ten months ended October 31, 1929, operating profits of $867,591 after all deductions except income tax. This compares with operating profits of $617,814 reported in the same period of 1928 and $395,421 in the same period of 1927.

Science to Dominate World's Fair

President Herbert Hoover on November 7, issued an invitation to all nations of the world, to join with the people of the United States in celebrating a century of progress at the centennial celebration of the incorporation of Chicago in 1933.

Rufus C. Dawes, a brother of Charles G. Dawes, American Ambassador to Great Britain, now in Washington as a guest of the President, is president of the corporation that is raising the necessary funds for the Chicago World's Fair.

Congress adopted a resolution last February authorizing the President to issue a proclamation inviting the world to participate in the celebration as soon as $5,000,000 had been raised toward defraying the expenses of the fair. Mr. Dawes furnished the necessary documents showing this sum had been obtained.

Elaborate preparations are being made for exhibits and other means of displaying progress in electrochemistry at the Fair. Dr. Colin G. Fink, of Columbia University, who is a member of the National Research Council's science advisory committee, is chairof the electrochemistry exhibit. He will be assisted by a number of leading authorities in the field, including Professor C. J. Brockman of the University of Georgia; T. F. Bailey of the Bailey Electro-Furnace Company, Alliance, Ohio; Professor H. S. Lukens of the University of Pennsylvania; and L. D. Vorce of the Westvaco Chemical Company, South Charleston, W. Va.

The group will act under the supervision of the National Research Council's science advisory committee, consisting of forty or more leading American scientists, in both the pure and applied fields, which has been asked by the Century of Progress trustees of the fair to work out a basic science theme to be the dominant feature of the Chicago centennial.

New Jersey Zinc Company

New Jersey Zinc Company reported for the quarter ended September 30, a net profit of $2,470,884 after taxes, depreciation, depletion and other charges. This compares with $2,447,806 in the preceding quarter and $1,983,469 in the September quarter of 1928. Net profits for the nine months totaled $6,945,625 against $5,444,928 in the first nine months of the previous year.

Bandits Murder Metal Firm Head

Samuel Levinson, 42, junior partner in the B. and L. Metal Stamping Company, 250 Moore Street, Brooklyn, N. Y., was shot to death by two bandits who entered his office on November 1 as he and three girls employed in his office were preparing to pay off the employees of the plant. The money, $550, was lying on one of the girls' desks when the gunmen entered and ordered the four to throw up their hands. According to the girls, Levinson started toward a door leading to the plant and shouted, "Let 'em have it." By this he meant that the girls were to give up the money without protest, but the gunmen, mistaking it for an order to someone in the plant to shoot at them, fired on Levinson and killed him. Screams from the girls frightened them and they escaped without the money.

Fessenden Awarded Sea Safety Award

Professor Reginald A. Fessenden, inventor of the fathometer, a device for measuring the depth of water under a ship at sea, a direction finder and other radio electrical devices, was awarded on November 7 "The Scientific American" gold medal for promoting safety at sea.

New Companies

Oakley Valve and Foundry Company, 48 Ferguson Street, Newark, N. J.; capital stock, 5,000 no par shares; to operate plant for manufacture of popper valves for internal combustion engines, including bronze, aluminum alloy and Monel and nickel foundry; by William E. Oakley, president.

International Stamping and Enameling Corporation, 360 Furman Street, Brooklyn, N. Y.; organized to manufacture enameled products, especially for sickrooms and hospitals; plans to purchase controlling interests in stamping concerns equipped to do the work, control of one such concern having already been acquired; dies and stamping machinery will be purchased for manufacture of products for which markets can be created; some grass spinning and stamping work will be let out on contracts; vitreous enameling will be done.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

DECEMBER 2, 1929.

Scovill Manufacturing Company directors have declared a dividend of $1 a share on the common stock, payable January 1 to stockholders of record December 16. This is the third consecutive quarter for which a $1 dividend has been declared. Previously it was 75 cents and two years ago, 65 cents.

Local industries, particularly the brass goods trade, clocks and watches, buttons, pins, etc., are much disappointed at the failure of the Senate to sustain the higher tariff rates on such products as set by the finance committee. In the debate in Congress on cutting the duties on clocks and watches it was declared by Senator Reed of Pennsylvania that the aggregate earnings of the **Waterbury Clock Company**, the **Lux Clock Company**, both of this city the **Seth Thomas Clock Company** of Thomaston, the **E. Ingraham Company** and **Sessions Company** of Bristol, the **Gilbert Clock Company** of Winsted and the **New Haven Clock Company** had fallen from $1,956,000 in 1925 to $1,737,000 in 1926, $1,688,000 in 1927 and to $1,627,000 in 1928.

Irving H. Chase, president of the **Waterbury Clock Company**, and the officials of the **Scovill Manufacturing Company** refused to comment on the publicity given in Congress to contributions by Mr. Chase and the Scovill company to the tariff lobby organization.

As soon as the present addition, 386 by 23 feet, now being built, is finished, the **Scovill Manufacturing Company** intends building another, 391 by 62 feet.

Twenty-two editors and publishers of national trade journals of the **McGraw-Hill Publishing Company** were here last month and inspected the plants of the **Scovill Manufacturing Company, American Brass Company** and the **Chase Companies, Inc.**

Henry J. Kast, who has retired as mechanical superintendent of the Plumbers' Brass Goods division (formerly the **American Pin Company)** of the **Scovill Manufacturing Company**, was tendered a banquet by his associates at Lakeside Tavern recently. W. W. Bowers, assistant secretary in charge of the American Pin Company branch, presided and highly praised Mr. Kast's services.

Fred Lux, secretary of the **Lux Clock Company**, has been granted a patent on an electric clock winding mechanism.

E. O. Goss, president of the Scovill Manufacturing Company, was one of the speakers on industrial development of Connecticut at the fifth annual meeting of the **New England Council** at Boston, the 21st and 22nd. The meeting emphasized aviation development in this section.

Local manufacturers of nickel silver, German silver and copper-zinc-nickel alloys are watching with interest the action of the Federal Trade Commission in registering a complaint against the **National Silver Company, Connecticut Silver and Nickel Silver Company** and others, setting forth that the practice should be discontinued of designating as "nickel silver" or "German silver" these white metals that in reality contain no silver. Local manufacturers are said to feel that the long usage of the terms justifies their continuance.

Employees of the radium dial painting department of the **Waterbury Clock Company** and many former employees have been examined by a staff of federal surgeons who are tour-

ing industrial centers for the purpose of making a thorough study of radium work in watch factories. Blood tests and X-rays were taken which will be studied by the government physicians and chemists and a report will be made to the government in conjunction with reports in other places. By making an exhaustive survey the government hopes to formulate precautions to be taken by employees and a cure, if possible, for those suffering from radium poisoning.

D. **C. Vandercook,** director of education, addressed the meeting of the Chase Foremen's Association last month. **Frederick S. Chase,** president of the **Chase Companies, Inc.,** will address the December meeting.

In addition to electing **President John A. Coe** of the **American Brass Company** and **President Frederick S. Chase** of the **Chase Companies** as members of the executive committee, the **Copper and Brass Research Association** at its meeting in New York in October elected **President Edward O. Goss** of the **Scovill Manufacturing Company** a member of the board of directors. Mr. Chase was also elected a vice-president of the association. —W. R. B.

Connecticut Notes

DECEMBER 2, 1929.

NEW BRITAIN—Joseph E. Stone, vice-president of the **Stanley Works,** was elected to fill a vacancy on the executive board of the **American Hardware Manufacturers' Association,** at the joint convention of that body and the **National Hardware Association** at Atlantic City, October 25th.

The Stanley Electric Tool Company, a subsidiary of the Stanley Works, has been incorporated in this city. It is authorized to issue capital to the amount of $50,000 and that sum has already been subscribed through the sale of 2,000 shares of common stock. The incorporators are **J. E. Cooper, L. W. Young** and **R. E. Pritchard,** all officials of the **Stanley Works.** The company has acquired the **Unishear Company** and the **Ajax Electric Hammer Company** of New York, and will manufacture the products formerly turned out by those concerns and also the electric machinery formerly made by the **Stanley Rule and Level Company.** All its operations will be centered in this city. The officers of the new concern are: President, **L. M. Knouse;** vice-president, **Cedric Powers;** treasurer, **L. W. Young;** secretary, **H. W. Blackman;** assistant secretary, **J. J. Holloway;** directors, **Clarence F. Bennett, James E. Cooper, L. M. Knouse, Cedric Powers, R. E. Pritchard, J. E. Stone** and **L. W. Young.**

Herman Fleischer, aged 85, celebrated the 60th anniversary of his connection with the **Stanley Works** last month. He is head of the plating, buffing, lacquering and polishing departments.

Charles F. Smith, chairman of the directorate of **Landers, Frary and Clark,** has donated to the park department a plaza, stairways and an approach to the recently constructed war memorial, the total cost of which will be around $37,000.

MERIDEN—Net profits of the **International Silver Company,** after charges for depreciation and taxes, amounted to $446,530 for the quarter ending September 30, as compared with $291,256 for the same quarter last year or $3.74 a share on the common after deducting the dividends paid on the preferred, as compared with $2.03 for the same quarter last year. Net profits for the nine months period this year were $1,098,972, as compared with $767,392 for the same period last year, or $8.58 per share as compared with $4.94 last year.

Two Newark, N. J., factories are to move here this month. **The Tiffany Company,** employing 200 persons, will move its plant into the factory recently acquired by the **General Instrument Company,** of which it is a subsidiary. The **Acme Sterling Company** will move into the **Parker Clock Company** plant on West Main Street. It will employ about 75 persons. Both are silverware concerns.

The International Silver Company has declared a dividend of one and one-half per cent on the common stock, payable December 1 to stock of record November 15. The company is planning an extensive addition on the site of the old Colt's plant.

BRIDGEPORT—A plot by which more than $30,000 worth of silverware was systematically stolen over a long period of time from the **Holmes and Edwards Silver Company** has been uncovered by local detectives who have trailed **Benjamin Karpilow** of this city for months. He is alleged to have stolen the silver and delivered it to **Sol Binder,** a salesman of New York City. An employe of the firm and his sister are said to be involved with him. He and Binder were arrested when he was in the act of turning over to the latter a package containing 18 sets of silverware.

WINSTED—For the first time in more than two years operations of the **Strand and Sweet Company** and the **Winsted Insulated Wire Company,** both wire factories, have been curtailed. The former has shut down alternate Sundays and the latter has closed temporarily on every Sunday. Both, however, are still working 24 hours daily on week days. Until a short time ago both had more orders than they could fill. In fact, during October, Strand and Sweet did a business of $109,000, which set a new record.

The William L. Gilbert Clock Company has made arrangements to go on the air daily, except during December, over the following stations: WOR, Newark; WLW, Cincinnati; WBBM, Chicago; WGY, Schenectady; KDKA, Pittsburgh; KRLD, Dallas; KHBC, Kansas City; WOC, Davenport; WLIT, Philadelphia; WSB, Atlanta; KMOX, St. Louis; WTAM, Cleveland and WCCO, Minneapolis.

NEW HAVEN—The Acme Wire Company has redeemed all of its preferred stock at $115 a share and accrued dividends.

The New Haven Clock Company has declared an extra dividend of 37½ cents a share, payable December 1 to stock of record November 15.

SOUTHINGTON—The Southington Hardware Company has declared the regular quarterly dividend of 37½ cents a share and an extra dividend of 37½ cents a share, payable December 1 to stock of record November 22.

STAMFORD—The Yale and Towne Manufacturing Company has declared a special dividend of $1 a share on the common stock to be paid December 14 to stock of record December 2. The company will acquire **H. and T. Vaughan, Ltd.,** of England by an exchange of 19,400 shares of its stock. The English company employs 900 hands. Statements of the latter company's income for the year ending June 30 shows net sales of $1,129,487 and net income after depreciation and taxes of $152,149 as compared with a net of $124,480 for the preceding year. Total assets amounted to $1,551,641 and current assets exceed liabilities five times. Yale and Towne owns subsidiaries operating under its name in London and Hamburg, and owns four other German companies and one in Czecho-Slovakia.

The Electric Specialty Company plans a new factory building 44 by 143 feet, two stories in height.

HARTFORD—Business of the **Long Security Lock Company** is running at capacity and shipment of 1,000 locks is being made daily. Manufacturers of gas meters recently placed a substantial order. New plant equipment is being installed and until more is added no additional business will be sought. —W. R. B.

Providence, Rhode Island

DECEMBER 2, 1929.

The metal industries here are entering upon the final month of the year with prospects of a continuance of the active business that has been enjoyed for some time past. Present indications are that the year as a whole will be one of the best for several years. All of the building trades branches are active and the various branches of the jewelry industry are running on good schedules.

Gorham Manufacturing Company reports for the first nine months of its current fiscal year a net income, after taxes, of $589,813. This compares with a net of $540,673 for the corresponding nine months of the previous fiscal period. The net income, after taxes for the month of October was $177,443, comparing with a net of $135,413 for October 1928. In the year ending January 31, 1929, the company reported a net income, after charges of $1,113,577. Earnings in previous years were as follows: 1928, $813,706; 1927, $642,446; 1926, $596,258.

Western Jewelry Manufacturing Company has removed its offices and plant from 72 Elm Street to larger and more commodious quarters at 226 Eddy Street.

The Blackstone Welding and Brazing Company, copper-

smiths, at 43 Japonica Street, Pawtucket, is owned by **Joseph A. Robichaud** of 70 Fletcher Street, Central Falls, according to a statement filed at the city clerk's office at Pawtucket.

The Supreme Manufacturing Company, Inc., has been incorporated under the laws of Rhode Island, to manufacture jewelry, with capital stock consisting of 500 shares of no par value, the incorporators being **Leon Elias, Simon W. Bergman** and **Fergus J. McOsker,** all of Providence.

E. V. Spooner, Inc., of Cranston has been incorporated by **Ella V. Spooner, Arthur H. Feiner** and **J. Clifden O'Reilly,** all of Providence, to manufacture metal findings and novelties. Capital stock consists of 100 shares of common, no par value.

Frank E. Farnham, president of the **Jewelers' Supply Company** of Providence, has been elected head of the newly organized **Metal Findings Manufacturers' Association,** a group with a charter membership of nearly forty concerns from Providence, Pawtucket, the Attleboros and South Norwalk, Conn. The other officers are as follows: Vice-President, **Ralph Gregory,** of Goodwin and Gregory; Treasurer, **William G. Kind,** of T. W. Lind Company; Secretary, **Harold E. Barker,** of the Fulford Manufacturing Company. Subjects concerning the association's welfare and of interest to the jewelry trade in general will be discussed by the members at the next meeting. The following concerns constitute the charter members under the by-laws and rules of organization as adopted: J. L. Anthony Company, B. A. Ballou and Company, Inc., Joseph P. Burlingame, W. R. Cobb Company, J. C. Doran and Sons, Excell Manufacturing Company, Fulford Manufacturing Company, Goodwin and Gregory, Jewelers' Supply Company, W. E. Kennison, Leach and Anthony, T. W. Lind Company, Linden and Company, MacMillan and Company, Inc., Samuel Moore and Company, Patton-MacGuyer Company, Providence Art Metal Company, William O. Reinhardt, Rhode Island Stamping Company, Roland and Whytock, E. V. Spooner Company, R. E. Thornton, Alfred Vester and Sons, A. T. Wall Company, A. E. Waller, J. Walsham Company, Wells Findings Corporation, Whitaker-Fielding Company and Whitney and Kahn, Inc., all of Providence. George H. Fuller and Son Company of Pawtucket; General Findings and Supply Company, Guyot Brothers, M. S. Company and Smith, Richardson Company, all of Attleboro; and the H and O Chain Company of South Norwalk, Conn.

Kurtz and Geisler, which was recently incorporated under the laws of Rhode Island to take over the manufacturing jewelry business conducted under that firm name at 226 Eddy Street, has organized under its charter with the following officers: president, **Carl Geisler;** vice-president and treasurer, **Salvatore Chaipenelli;** secretary, **John H. Kurtz.** New quarters have been secured at 105 Gordon Street and the plant will be moved there at an early date.

Notice has been filed at the office of the Secretary of State of an amendment to the charter of the **United Wire and Supply Company** of Cranston whereby the capital stock is changed from $350,000 and 7,500 shares of common stock of no par value to $600,000.

Style-Craft Jewelry Company has been incorporated under the laws of Rhode Island, with an authorized capital consisting of 600 shares of common stock of no par value. The incorporators are: **W. Harold Hoffman, Mason B. Merchant** and **Noel M. Field,** all of Providence. —W. H. M.

Middle Atlantic States

Newark, N. J.

DECEMBER 2, 1929.

Charging that the company he founded has become insolvent since he was ousted, **Oliver L. Badger,** of Plainfield, N. J., has obtained an order from **Vice-Chancellor Backes** directing the **Radio Electric Clock Corporation** of Linden, N. J., to show cause why a receiver should not be appointed for it. Badger, holder of 500 shares of Class A stock, claims to be a creditor of the company to the amount of $100,000. The claim is based on a ten-year contract of employment by which he was to obtain $10,000 a year. The contract was breached, he charged. The clock concern was incorporated June 27, 1924, in Delaware, with an authorized capitalization of $1,000,000 made up of 100,000 shares of Class A stock and 200,000 shares of Class B stock. The bill listed the company's assets as $149,326.65, and the liabilities as $44,255.85. It also was asserted that a balance sheet issued January 31 last showed the company lost $100,695.97 between April, 1928, and January 31, 1929.

Badger organized the company to develop patents obtained by him, he alleges, and after the other officers entered the concern they interfered with his regime as general manager, created dissension and finally ousted him. As a result of his ousting, the bill says, the company has suffered heavy financial loss. The bill charges that **John A. Harris, 3d,** secretary, put $100,000 into the company, for which he received 10,000 shares of Class A stock and 14,000 shares of Class B stock and was given full power to "hire or fire" any one. The bill states that the patents held by the concern are valued at $66,414, while a few years ago the patents were valued at $521,140.

The Beaver Manufacturing Company, 625 to 645 North Third Street, Newark, has completed a large addition in the rear of the plant, to be used for assembly, finished stock and shipping departments. The company manufactures electrical wiring devices, including switches, sockets, plugs, receptacles, etc., and the plant employs 200 people.

The property formerly occupied by the **J. M. Quimby Company,** 23 Sterling Street, East Orange, has been sold to the **Adelphia Company** for the **Eleven Twelve Corporation.** The property consisted of a two-story brick factory addition with offices in the front part. **Radio Tool and Die Company** will use the building for the manufacture of radio parts.

The following concerns have recently been incorporated: **Excel Brass Foundry, Inc.;** to manufacture brass; $125,000. **John Johnson Turbine Mixer Corporation;** tool makers; $50,000 preferred and 300 shares common. **Cambet Ring Manufacturing Company;** manufacture jewelry; 1,000 shares common.

—C. A. L.

Trenton, N. J.

DECEMBER 2, 1929.

Acosta Aircraft Corporation, of which **Bert Acosta,** internationally known aviator, is the head, is in a state of dissolution as far as the Trenton plant is concerned. An auction sale was scheduled recently under a District Court order obtained by the **Roller Bearing Company of America** to recover $2,949.99 rental on the building occupied by the Acosta firm. In addition, numerous court actions are swamping the company and employees of the firm have retained counsel in an effort to collect back wages. Because of the various pending litigations the sale was postponed in order to allow counsel for the employees to apply for a receivership. If the receiver is appointed, all the plant equipment, including six dismantled airplanes, will be sold. If the receivership fails, a public auction sale will be held. Counsel for the **Roller Bearing Company** obtained a court order to oust the Acosta company, and the aviator's company has been dispossessed. Acosta equipped the plant with machinery for the manufacture of airplanes and speed boats.

A jury in the United States Court here returned a verdict of $55,343.65 in favor of the **Keystone Watch Case Company** of Riverside, N. J., the plaintiffs in an action on a contract brought against the **Automobile Devices Corporation** of Camden, N. J. The amount sued for was $65,000, which included interest. It was the contention of the defense that the Riverside concern had failed to follow specifications in the manufacture of an automobile accessory, a gasoline filter. The verdict was returned by **Judge Runyon.**

William L. Schulte, vice-president and shop superintendent of the **Trenton Brass and Machine Company,** Trenton, N. J., has been elected a director of the **Prospect National Bank.**

Hobson Flatware Company, Lambertville, N. J., which recently erected a new plant at that place and moved there

from Lansdale, Pa., is now running full handed. Nearly all the employees of the company moved here. The company manufactures chromium and nickel plated knives, forks and spoons.

The following concerns have been incorporated here: **Protective Devices Company;** metal devices; $50,000 preferred and 5,000 shares common; Camden. **Moreset Engineering and Machine Company;** pumps and valves; $10,000; Jersey City. **Oxford Vitreous Enameling Corporation;** enamel ware; $100,000; Oxford. **The Birmingham Guild, Inc.;** manufacture bronze products; 2,500 shares Jersey City. **W. Sarbone Company;** manufacture radio accessories; $100,000; Paterson. **Mills Sheet Metal Works;** manufacture sheet metal products; Union City. **Penn Jersey Metal Products Corporation;** $125,000; Camden.

—C. A. L.

Middle Western States

Detroit, Michigan

DECEMBER 2, 1929.

Production is more or less quiet in the non-ferrous manufacturing plants in the Detroit area. This is a condition that may be felt to some extent until around February 1. Much of the quietness may be attributed to the annual inventory period; however, there is no getting around the fact that general business is quiet. This is particularly true in the motor car industry, where most of the plants are on very low production. If conditions may be judged by previous late fall and winter periods, motor car manufacturing will not start vigorously until late in January. Not much more can be said.

Announcement is made of the consolidation of the **Thomson Electric Welding Company** of Lynn, Mass., with the **Gibb Welding Machine Company** of Bay City, Mich. The new organization will be known as the **Thomson-Gibb Electric Welding Company.** Both plants will continue in operation, it is stated. The company offers a full line of butt, flash, seam, spot, projection and wire fabric welders, together with expert service designed to secure uninterrupted production and uniform quality from its machines in the hands of manufacturers.

Ivers Chrome and Metal Plating Company, 1422 East Larned Street, Detroit, has been incorporated for the purpose of dealing in metal products and by-products. Its capital stock is $20,000. The owners are: **Wallace J. Ivers, L. Robert Lilley** and **Orlie W. Dawson.**

The National Parts Association held its annual convention and exposition in Detroit from November 11 to 15. More than 7,000 delegates and visitors attended. The exposition this year contained one of the most extensive displays of automobile replacement parts and accessories ever shown. The Association is composed of more than 425 automobile replacement manufacturers and wholesalers.

Wise Chrome Products Company, organized in 1928 by **M. M. Wise,** president and general manager, has experienced rapid growth during the past year. Capacity production was reached 30 days after the plant was placed in operation, and this working schedule has been maintained the greater part of the time, according to Mr. Wise. The plant is considered one of the largest and most up-to-date engaged exclusively in plating.

It is announced that the Detroit plant of the **Detroit Aircraft Corporation,** now manufacturing the "Eastman Flying Boat," shortly will be producing primary gliders on a commercial basis. According to **James Work,** vice-president and general manager, the manufacture of gliders will serve to stabilize the production of the plant during the winter season, when the manufacture of airplanes is naturally curtailed. He also announces that the production of primary gliders should help to stimulate a natural market for airplanes by developing air-mindedness among students. The Detroit Aircraft Corporation, with main offices in Detroit, manufactures airplanes, all-metal dirigibles and flying boats, and operates airports and flying schools.

A merger of the **Stinson Aircraft Corporation** of Detroit with the **Cord Corporation** of Chicago was effected November 9. At a meeting of the directors of the Stinson company, **E. L. Cord** was elected chairman of the board; **Edward A. Stinson,** president; **William A. Mara,** vice-president; **Raymond S. Pruitt,** secretary; and **William R. DeFiend,** treasurer. Under the terms of the merger, stockholders of the Stinson Corporation were given the option of receiving $17.50 for Stinson stock, or one share of Cord Corporation stock for each two shares of Stinson stock. Enough stock was turned in by Stinson stockholders to give Mr. Cord a controlling interest in the Stinson Aircraft Corporation, it is stated.

It is expected the $47,000 addition to the plant of the **Stout Metal Airplane Company,** a division of the Ford Motor Company, at Dearborn, Mich, will be completed some time this month. Machinery will be installed so that work may be resumed on a full time basis not later than January 6, it is stated. With this expansion the Stout plant will be enabled to produce one plane daily, but this rate of production, it is expected, will not be reached until late next spring.

Employees of the **Mueller Brass Company** at Port Huron, it is announced, have voted to donate their employees' aid fund of $18,000 as the nucleus of a fund of $500,000 for the erection of a hospital as an honor to **Thomas A. Edison,** whose boyhood home was in that city.

The Campbell, Wyant and Cannon Foundry at Muskegon is erecting a building 80 by 140 feet, designed to house its offices.

The net profit of the **C. M. Hall Lamp Company** at Detroit, manufacturers of automobile lamps, for the first nine months of 1929 was $1,036,000, after all charges, including provision for federal taxes, according to announcement. This compares with $784,000 for the first nine months of 1928.

Negotiations for the merger of the **Wilcox-Rich Corporation** and the **Bohn Aluminum and Brass Corporation** have been declared off, it is stated, due to inability to get together on terms of a basis of exchange of stock.

It is announced that **T. M. Butler** has resumed active management of the **Butler Industries, Inc.,** of Detroit and Chicago, as well as the **Welding Service and Sales Corporation,** following an absence of about eighteen months due to ill health.

A contract has been let for the erection of an addition to the **Eureka Vacuum Cleaner Company,** Detroit. This concern is one of the largest producers of vacuum cleaners in the United States.

—F. J. H.

Toledo, Ohio

DECEMBER 2, 1929.

Owing to its varied industries, Toledo is not experiencing the slow-up in manufacturing as some of the other lake cities. Nevertheless, business is not making the showing it did a year ago at this time. This is particularly true concerning the non-ferrous metal trades and manufacturers of motor cars and accessories. The latter line will be more or less quiet, it is expected, until after the first of the new year.

The plating industry also is quiet, but not to such an extent as might be expected. Those concerns not affected by the motor car industry in many instances are moderately busy.

George M. Graham, vice-president of the **Willys-Overland Company,** in a recent address before more than 300 of the company's dealers and their salesmen, outlined and explained the policies which have been inaugurated since **L. A. Miller** assumed the presidency of Willys-Overland. He characterized Mr. Miller's statement to the effect that motor car manufacturers must gauge their future production more accurately in line with public absorption, as "the most courageous stand taken by any leading car manufacturer in the past decade."

One thousand five hundred workmen were returned to their jobs in the plant of the **Chevrolet Motor Company** on Monday, November 18, following a lay-off of two weeks.

—F. J. H.

Other Countries

Birmingham, England

NOVEMBER 18, 1929

The metal trades of the Midland district continue to do a moderate business. Copper has been falling in price during the month and has been closely affected by Wall Street influences. It is believed, however, that prices have touched bottom and there is likely to be a reaction before the end of the year.

The rollers of brass sheets find new business is slow in coming in. The basis price of brass sheets, strip and wire was reduced during the week ended November 8th, by a farthing per pound, but this is believed to be due to the low prices prevailing for spelter. Buyers of these products considered that a reduction was long overdue. The lighter gages of brass and copper tubes have been in good demand and prospects indicate a spell of activity for the next two months. Trade has been assisted by the lowering of the English bank rate. It will be remembered that this was advanced from 5½ to 6½ per cent on September 26, but the Wall Street crash have resulted in a drop to 6 per cent, so that traders will be able to obtain money at an easier rate.

In the silver and electroplate industries of Birmingham, work has been fairly regular during the year and as there is pressure now for seasonal business employers of labor are not always able to obtain skilled workmen to cope with the rush. There are hopeful signs, however, that the expansion of business in 1929 is attracting more youths into the industry.

Electroplate makers have benefited from the orders for ships as some of the main ocean lines have improved their services. A fair volume of business is being done with India and South Africa, and New Zealand is a good market. Australia is making more and more products for itself, and British manufacturers in other trades as well as electroplate are not finding many openings for negotiations with that country. Some Birmingham firms are doing an increasing trade with Canada and some orders come from South America.

The records of exports from the Midlands to the United States in the third quarter are published by the Birmingham Consulate. The total value in that period was $3,807,825 against $2,353,518 in the third quarter of last year. Much of the increase, unfortunately, is accounted for by the inclusion of Leicester in the Midland district. Among products originating in the Birmingham district which show increases are steel tubing, $238,227 to $240,407; other iron and steel, $21,285 to $62,898; plated ware and silver $9,084 to $142,446; all other metal manufacturers, $73,726 to $133,659. The value of exports of brass ware decreased from $60,724 to $50,259.

Most of the new designs in motor cars at the show this autumn embodied chromium plating as a necessary finish to the metal parts such as radiators, door handles, lamps, etc.

A. B. W. Canning and Company of Great Hampton Street, Birmingham, have just installed at the Morris Motor Works at Oxford, an automatic combined plant for nickel and chrome plating which it is stated is the first of its type in Great Britain.

—J. A. H.

Business Items—Verified

Specialty Brass Corporation, Lake Shore Road, Kenosha, Wis., care of C. M. Anderson, has postponed construction of a plant addition originally planned for this year.

General Chemical Company has removed its Philadelphia, Pa., office to the Liberty Trust Building, 1343 Arch Street. The telephone numbers are: Bell, Rittenhouse 3100; Keystone, Race 1711.

General Electric Company, Schenectady, N. Y., has awarded a contract for the reconstruction of a one-story alloy foundry on East Lake Road, Erie, Pa. The work will be done by **E. E. Austin and Company,** Erie.

Columbia Metal Stamping and Die Company, 1536 East 49th Street, Cleveland, Ohio, has let a contract for a one-story, 90 x 22 ft. plant on East 116th Street and Harvard Avenue, Cleveland, to cost about $150,000.

National Bronze and Aluminum Foundry Company, East 86th Street and Laisy Avenue, Cleveland, Ohio, is enlarging its plant by the addition of a one-story 71 x 109 x 200 ft. building of monitor type. The company smelts and refines metals and operates a brass, bronze and aluminum foundry.

Sheet Aluminum Corporation and its affiliated organization, **Hybinette Patents Corporation,** Jackson, Mich., have acquired a building there and will use it as a metallurgical and experimental laboratory for work in aluminum alloys and other metals. This will be operated by the Hybinette concern after remodelling.

The Standard Underground Cable Company, Pittsburgh, Pa., a division of the **General Cable Company,** New York, will remove to Perth Amboy, N. J., during December, where its operations will be continued in conjunction with other units of the General Cable Company, which was formed some time ago by a merger of a number of firms including Standard Underground.

L. A. Darling Manufacturing Company, Bronson, Mich., metal display fixture maker, is putting up a new two-story addition at cost of about $40,000 with equipment. The new brick and steel building will house a modern plating plant and other production equipment. The building is expected to be in use by the middle of December, according to **J. Dean Spencer,** president.

Paasche Airbrush Company, Chicago, Ill., has expanded the personnel of its Cleveland, Ohio, branch by the addition of two salesmen, **H. V. Schweitzer** and **J. G. Newman. D. Bordoe-Nielsen** continues as branch manager. Larger sales and display rooms have been obtained at 722 Perry-Payne Building and a complete stock of Paasche equipment will be kept for Cleveland district customers.

Brasco Manufacturing Company, 5035 South Wabash Avenue, Chicago, Ill., manufacturer of metal store fronts, rolled mouldings, etc., has acquired the **Morgan-Gardner Electric Company** plant at Halstead and 152nd Streets, Harvey, Ill. The acquired plant contains about 50,000 sq. ft. of floor space and has 3½ acres of land. The Brasco company will use the plant for its own operations.

Florence Stove Company, Gardner, Mass., manufacturer of oil stoves, recently acquired the E-Z-est Way Stove Works, Kankakee, Ill., and manufacturing operations of both plants are now in charge of **W. L. Cooper,** formerly with the Kankakee firm. His headquarters are at Boston, Mass. The Florence company is installing a new continuous oil-fired "Ferro" porcelain enameling furnace.

The S. P. Levy Electroplating Company, 430-32 East 188th Street, New York City, has added a completely equipped chromium plating department to its plant, formerly devoted to nickel, brass, copper and silver plating. The plant is one of the largest job shops in upper Manhattan and the Bronx, according to S. P. Levy, head of the firm, which was formerly known as the Ram Electro-Plating Company.

The Columbia Metal Stamping and Die Company, Cleveland, Ohio, manufacturers of parts for automobiles, radios and electrical appliances, has agreed to purchase a new $50,000 manufacturing building from **Harold K. Ferguson,** president of the **H. K. Ferguson Company,** now being built on the Ferguson Industrial Allotment at East 116th Street and Harvard Avenue, Cleveland. Designed by Ferguson engineers, the plant is to be modern in every respect.

Young Radiator Company, Racine, Wis., manufacturers of radiators cooling systems and heating units, reports that its business is now the heaviest it has ever been and that plans are under way for improvements that will double production capacity. According to F. M. Young, president, much new machinery has already been installed. The personnels of the accounting, purchasing and engineering departments have also been enlarged in line with expanded output.

Employes of the **Malone Bronze Powder Works, Inc.,** Malone, N. Y., are participating in the benefits of more

than $75,000 of life insurance supplemented by weekly sick and accident benefits, through contract made by their employer with the Metropolitan Life Insurance Company. The program is being underwritten on a cooperative basis, whereby the employer makes liberal contributions towards premium payments. A feature of the plan is a free visiting nurse service.

The Lea Manufacturing Company, 987 Watertown Avenue, Waterbury, Conn., manufacturers of greaseless polishing compounds, has opened a branch office and warehouse at 8711 Lawton Avenue, Detroit, Mich. **P. W. Ellwanger** is in charge of the Detroit branch. A new office and warehouse has also been opened at 248 Lafayette Street, New York City, with **C. R. Percival** in charge. Complete stocks of greaseless compositions will be carried at both of the new warehouses.

National Harris Wire Company, Verona and Mount Prospect Avenues, Newark, N. J., wire and tubing manufacturers, have taken over the remainder of the **Heller Brothers File Works** plant, part of which the National Harris firm has been occupying. The company has purchased the **Connecticut Wire Company,** Waterbury, Conn., and will consolidate operations at Newark, where the Waterbury plant will be taken. The company specializes in nickel tubing and various wire products. **Francis R. Harris** is president.

The Newman Manufacturing Company, Cincinnati, Ohio, architectural and ornamental brass, bronze and metal work, has been awarded a contract for the bronze work on the Chicago store of A. Sulka and Company. The company is a large factor in the industry, operating brass, bronze and aluminum foundry and machine shop, soldering, welding, brazing, plating, polishing, lacquering and tool departments. According to **W. N. Mackey,** director of marketing, the company is not in the market for equipment at this time but is always glad to hear from manufacturers about new products.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

DECEMBER 2, 1929.

During the month of November business activity turned definitely downward and confirmed the trend indicated during October. Such falling off was particularly noticeable in the automobile. radio, building and most luxury lines. As these industries slowed down they affected other raw materials, including copper and products manufactured from copper or its alloys. In addition, the copper and brass industries normally enter a "slowing down" period at this time of the year. The severe stock market debacle has not helped matters, but on the contrary has created a doubtfulness about the actual business situation that is hardly warranted. Now that the picture has been painted as black as possible we are already beginning to see rifts in the clouds. President Hoover and other business leaders are assuring the country of tremendous expansion programs to be undertaken during the balance of this year and in 1930. The public utilities will spend during 1930 a staggering total for new installations and for replacement. The railroads are proceeding with their electrification programs, and probably with cheap money there will be a revival in building activity. It is significant and worthy of especial notice that these activities will use large tonnages of copper and its alloys.

At this time a great deal of talk is heard of possible reduction in the price of copper, but thus far no price cut is in sight. The producers are maintaining the price at 18c. Probably further curtailment of production will be necessary with custom smelters filling present demands for copper. However, it is almost certain that sooner or later another buying movement must start. It is highly desirable to have a stabilized price instead of a fluctuating one, and the copper producer realizes this more than ever before. Formerly the brass mills and their customers were the ones affected, but now, due to the integration in the industry, the copper producer through his mills has thousands of customers, where formerly he had relatively few. Europe is taking fair amounts of copper. If the buyers in this country would only purchase on a regular basis instead of spasmodically there would be no chance of such wild fluctuations in the price as have prevailed in the past. If the price remains on an even keel every one in the copper and brass industries, except those that want to speculate in the metal, will be better off, including the ultimate consumer.

The copper wire situation is still good but, of course, not as good as it was. Looking toward 1930, it seems almost certain that the demand for copper wire will be as good, if not better, than this year.

October was a record-breaking month for Monel metal, with deliveries somewhat difficult to obtain. The month of November was almost as good. There was little slackening in production; on the contrary, facilities were improved so that despite the large demand deliveries were obtainable within a reasonable time.

Demand for nickel eased off somewhat because of curtailed demand for alloy steels containing nickel. However, the nickel business has not slowed down to where it could be classed as only fair. Demand for nickel still continues active.

Metal Market Review

By R. J. HOUSTON
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

DECEMBER 2, 1929.

Last month copper was called upon to stand the strain and test of unprecedentedly stirring times in the financial world. The market impressively proved its ability to go through the recent hectic debacle in the stock market without developing serious price weakness for the actual metal. It remained conspicuously steady, even when the security market was at its worst, and buyers were characteristically prompt to adopt a conservative policy in making new commitments for other than actual requirements. As a matter of fact, fundamental conditions in copper are notably sound. Domestic consumption has moved forward with remarkable rapidity this year. This is the factor of major importance in the situation.

ZINC

The zinc situation continues to feel the depressing effect of over-production. Excessive world stocks are the handicap the market has to contend against. This has been an outstanding weak spot for a long time, and until this condition is changed values will be proportionately affected.

Prime Western slab zinc at present quotes 6.15c-6.20c East St. Louis and 6.50c-6.60c New York. Foreign prices have also shown a sagging tendency lately. They are quite near to the point where the foreign commodity might become a competing factor in this market.

TIN

A downward tendency developed in tin during the past month due to the uncertainty of conditions and the stock market collapse. Prices broke through to new low levels for the past six years during the first half of November. Spot Straits sold at 39⅛c. There was considerable confusion and unsettlement apparent among dealers and consumers over the outlook in view of the violent

crash in Wall Street and the weakness both in London and New York markets. After a good deal of hesitancy the market moved forward again on stronger developments in London and heavy purchases by leading operators at that center. Near the month-end prompt Straits tin had advanced to 41½ cents. Consumers, however, were not inclined to follow the upward trend very eagerly.

There were reports of a scheme for curtailing output and the prospect of cutting down production has apparently stimulated markets on both sides of the Atlantic into a fresh outburst of strength and activity. Sales abroad have been particularly heavy lately. Domestic consumers placed substantial orders when the market dipped to below 40 cents.

LEAD

Conspicuous among recent developments in lead were two price reductions in the early part of November. The total recession brought the market down to the basis of 6¼c. New York and 6.10c. East St. Louis. Brisk buying followed the lower values and the response from the trade was indicative of growing confidence among consumers. Demand was for nearby and December positions with some orders taken for January. Lead production of the world for October was reported at 169,501 short tons as against 159,018 tons in September. The increase came principally from the United States, Canada, Mexico and Australia.

ALUMINUM

Domestic consumption of aluminum continues on a large scale. Most consumers, however, appeared inclined to keep stocks down to a minimum and adhere to the hand-to-mouth policy in buying. Large requirements are backing up for the first quarter of next year. Despite the quiet state of market there has been no weakening of prices for primary metal. Exports of aluminum from Canada in October amounted to 8,732,700 pounds as compared with 1,372,800 pounds in September and 6,510,600 pounds in October, 1928. The imports of aluminum into the United States during the first nine months of 1929 were 35,033,137 pounds, against 25,414,194 pounds in the corresponding period of 1928, an increase of 9,618,943 pounds. Aluminum output and consumption in Germany shows a substantial increase this year. Consumption in that country is in excess of production.

ANTIMONY

Market changes in antimony were slight and of minor importance. In view of tariff possibilities buyers hesitated placing orders for China shipment owing to uncertainty over what rate of duty would be imposed on arrival of material here. The proposed new schedule is so extraordinary as to leave both sellers and buyers very much at sea as to ultimate costs of transactions in transit. Sellers were not actively pressing supplies, but a fair tonnage of spot regulus was sold at 8½c. duty paid. Consuming demand quieted down at month-end and holders were quoting 8⅝c. for prompt and future deliveries. Stocks of antimony regulus in bonded warehouses on October 1 amounted to 3,048,677 pounds as compared with 2,415,399 pounds on same date a year ago.

QUICKSILVER

Trade in quicksilver is routine but stocks are sufficient to take care of demand. Recent buying movement was limited to prompt delivery. Present price is quoted at $124 to $124.50 per flask. A firmer tone is expected to develop.

PLATINUM

A steady tone prevails in trade circles and refined platinum is quoted at $61 to $61.50 per ounce.

SILVER

The price structure in the market for silver bullion was fairly stable lately. Prices seem to have reached a point where depression can hardly go much further if producing interests are to get a reasonable equivalent for output. Market quotations of under 50 cents an ounce should not tend to overproduction. Demand from China and India has not been extensive enough to lift prices.

OLD METALS

Buyers of scrap metal were particularly cautious lately and the markets for secondary material were considerably depressed. A dull and unsettled state of feeling prevailed among dealers. Those making shipments against contracts based on quotations for primary metal were getting the cream of the situation. Consumers have been looking for recessions and this attitude tends to restrict sales. Offerings of certain grades were in heavier volume, but both buyers and sellers are waiting for a more clarified situation and more settled conditions. Dealers are quoting the following as buying prices. First quality crucible copper 15c. to 15¼c, light copper, 11¾c. to 12c., heavy brass, 7½c. to 7¾c., light brass 6¾c. to 7c., new brass clippings 10½c. to 10¾c., heavy lead 4c. to 4¼c., old zinc 2½c. to 2¾c. and aluminum clippings 17c. to 17¼c.

Daily Metal Prices for the Month of November, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4	5*	6	7	8	11	12	13	14	15	18
Copper c/lb. Duty Free												
Lake (Del.)	18.125	18.125	.....	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	17.875	.....	17.875	17.875	17.875	17.875	17.875	17.875	17.50	17.50	17.50
Casting (f. o. b. N. Y.)	17.00	17.00	.....	16.50	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	6.50	6.50	.....	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Brass Special	6.55	6.55	.....	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.30
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	40.70	40.125	.....	39.625	39.75	39.625	39.125	39.375	39.375	40.00	39.875	40.125
Pig 99%	40.00	39.50	.....	38.75	38.875	38.875	38.375	38.625	38.625	39.25	39.125	39.375
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.35	6.35	.....	6.20	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	.....	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	.....	35	35	35	35	35	35	35	35	35
Shot	36	36	.....	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	.....	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.625	8.50	.....	8.375	8.375	8.50	8.50	8.50	8.50	8.50	8.50	8.50
Silver c/oz. Troy Duty Free	50	49.875	.....	49.625	49.625	49.375	49.375	49.625	49.375	49.375	49.375	49.625
Platinum $/oz. Troy Duty Free	62	62	.....	62	62	62	62	62	62	62	61.50	61.50

	19	20	21	22	25	26	27	28*	29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	....	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	17.50	17.50	17.50	17.50	17.75	17.75	17.75	....	17.75	18.00	17.50	17.717
Casting (f. o. b. N. Y.)	16.25	16.50	16.75	16.75	16.875	16.875	16.875	....	16.75	17.00	16.25	16.533
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	6.25	6.25	6.25	6.25	6.25	6.15	6.00	....	6.00	6.50	6.00	6.245
Brass Special	6.30	6.30	6.30	6.30	6.30	6.30	6.10	....	6.10	6.55	6.10	6.305
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	39.875	40.15	41.125	41.50	41.875	41.50	40.50	....	39.875	41.875	39.125	40.216
Pig 99%	39.25	39.50	40.50	40.75	41.25	40.75	39.75	....	39.125	41.25	38.375	39.487
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.10	6.10	6.10	6.10	6.10	6.10	6.10	....	6.10	6.35	6.10	6.13
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	....	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	....	35	35	35	35
Shot	36	36	36	36	36	36	36	....	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	....	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.625	8.625	8.625	8.625	8.60	8.60	8.50	....	8.50	8.625	8.375	8.530
Silver c/oz. Troy Duty Free	49.875	49.875	49.875	49.875	49.625	49.625	49.25	....	49.50	50.00	49.25	49.618
Platinum $/oz. Troy Duty Free	61.50	61.50	61.50	61.50	61.50	61.50	61.50	....	61.50	62.	61.50	61.737

* Holiday.

Metal Prices, December 2, 1929

NEW METALS

Copper: Lake, 18.125. Electrolytic, 17.75. Casting, 16.75.
Zinc: Prime Western, 5.95. Brass Special, 6.05.
Tin: Straits, 38.80. Pig, 99%, 38.00.
Lead: 6.10. **Aluminum,** 24.30. **Antimony,** 8.50.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $124.00. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 49.25.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $61.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¼to13½
Brass Ingots, Red	15½to16½
Bronze Ingots	16½to19
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	27 to39
Manganese Bronze Ingots	13½to19
Manganese Bronze Forging	35 to43
Manganese Copper, 30%	28 to40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	17 to21
Phosphor Copper, guaranteed 15%	20½to24
Phosphor Copper, guaranteed 10%	20 to23½
Phosphor Tin, no guarantee	45 to60
Silicon Copper, 10%, according to quantity	25 to35

OLD METALS

Buying Prices		Selling Prices
14 to14½	Heavy Cut Copper	15 to15½
13½to13¾	Copper Wire, mixed	14½to14¾
12 to12¼	Light Copper	13 to13¼
11 to11¼	Heavy Machine Composition	12 to12¼
7¾to 8	Heavy Brass	8¾to 9
6¼to 6¾	Light Brass	7¼to 7¾
11 to11¼	No. 1 Composition	12 to12¼
10 to10¼	Composition Turnings	11 to11¼
4⅜to 4⅞	Heavy Lead	5⅜to 5⅞
2½to 3	Zinc Scrap	3½to 4
15½to16	New Aluminum Clips	19½to20
10 to10¼	Scrap Aluminum, cast alloyed	15 to15¾
10½to11	Scrap Aluminum sheet (new)	13 to14
24 to26	No. 1 Pewter	29 to30
20 to21	Old Nickel Anodes	22 to23
20 to23	Old Nickel	22 to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....27¾c. to 28¾c. net base
From Stock .....28¾c. to 29¾c. net base

BARE COPPER WIRE

19⅝c. to 19⅞c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order .....26¼c. net base
100 lbs. to 200 lbs. in one order .....26¾c. net base

ZINC SHEET

Duty on sheet, 2c., per pound	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	10.50 net base
Casks, jobbers' price	10.75 net base
Open casks, jobbers' price	11.25to11.75 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 51.50c. per ounce, Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.23¼	$0.25	$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30⅞	....	.35⅞
Open seam tubing	.31¼	....	.34¼
Angles and channels	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	24c. net base
Muntz or Yellow Rectangular sheet other Sheathing	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	31⅜c.	10% Quality	34⅛c.
15% Quality	33c.	15% Quality	37¾c.
18% Quality	34¼c.	18% Quality	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, December 2, 1929

ANODES

Copper: Cast	28c.	per lb.	
Rolled, oval	27c.	per lb.	
Rolled, sheets, trimmed	27¾c.	per lb.	
Brass: Cast	27c.	per lb.	
Zinc: Cast	12⅛c.	per lb.	

Nickel: 90-92%	45c.	per lb.
95-97%	47c.	per lb.
99%	49c.	per lb.

Silver: Rolled silver anodes .999 fine are quoted from 53c., Troy ounce, upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/28 Unbleached	$28.27 to $28.30
14" 20 ply 64/68 Unbleached	36.45 to 37.34
12" 20 ply 80/92 Unbleached	31.25 to 34.16
14" 20 ply 80/92 Unbleached	42.40 to 46.09
12" 20 ply 84/92 Unbleached	39.31 to 42.90
14" 20 ply 84/92 Unbleached	52.62 to 57.60
12" 20 ply 80/84 Unbleached	38.35 to 39.37
14" 20 ply 80/84 Unbleached	52.00 to 53.12

Sewed Pieced Buffs, per lb., bleached ..... 52c. to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12-.18
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 to 400 lb. drums	lb.	.19-.21
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.03
Alcohol—Butyl	lb.	.16¾-.21¼
Denatured, drums	gal.	.50-.60
Alum—Lump, Barrels	lb.	.0385
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	3.3
Aluminum chloride, solution in carboys	lb.	.06½
Aluminum—Sulphate, tech., bbls.	lb.	.33
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.30-.50
Copper—Acetate (Verdigris)	lb.	.25
Carbonate, bbls.	lb.	.21½
Cyanide (100 lb. kgs)	lb.	.45
Sulphate, bbls.	lb.	6.2
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.12½-.13
Salts, double, 425 lb. bbls.	lb.	.12½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.083
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.40½
Cyanide (fluctuating)	oz.	.50-.55
Nitrate, 100 ounce lots	oz.	.36
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.34
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¼
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

DEC 12 1929

Volume 27 Number 12 DECEMBER, 1929 Two Dollars Per Year

Contents Text Page 569 Buyers' Guide Advertising Page 91

Publication Office: 99 John Street, New York

THE METAL INDUSTRY is Published monthly by The Metal Industry Publishing Company, 99 John Street, New York, N. Y., U. S. A.
Entered as second class matter February 10, 1903, at the post office in New York under the Act of March 3, 1879

Why Keep It A Secret?

FOUNDRIES that are producing their castings in plumbago (graphite) crucible-melting equipment have a valuable sales weapon available to them. Why keep it a secret? Tell the world — meaning your customers and prospects — about it. Educate them to the merits of crucible-melted castings.

Your customers, of course, appreciate the quality of your castings. But emphasize to them that you have refused to substitute quantity production of unknown quality for quality production of tried and proven metals.

Most important, tell your prospects that your products are crucible-melted. In your estimates and quotations, stress the higher quality of crucible-melted castings. Tell why they are different—and better. Your argument, convincing as it must be, may be the turning point that will bring many an order to you that might otherwise have been lost. In contrast to "new" or "improved" methods, crucible-melting is recognized as the source of the highest-quality castings.

And lastly, keep the members of your own organization "sold" on crucible-melting practice because it is money in their pockets. Show them that carrying charges are lowest because of the small initial outlay of capital for equipment. Show them that operating charges are at a minimum, in part due to the opportunity initially offered to select intelligently from several possible fuels the one particularly suited to your operations. And from the operating standpoint, show them why your capital expenditure for several low-cost melting units, independently operative in such number and combinations as daily demanded, returns dividends by permitting proper and economical coordination between the furnace room and the mould floor.

Joseph Dixon Crucible Co., *Jersey City, N. J.*
Lava Crucible Co. of Pittsburgh, *Pittsburgh, Pa.*
Naugatuck Valley Crucible Co., *Shelton, Conn.*
Ross-Tacony Crucible Co., *Tacony, Phila., Pa.*
Vesuvius Crucible Co., *Swissvale, Pa.*
Bartley Crucible & Refractories Co., *Trenton, N. J.*
Chicago Crucible Co., *Chicago, Ill.*

Remember! ONLY

PLUMBAGO (GRAPHITE)

CRUCIBLE-MELTING

Gives Crucible Quality, Flexibility, Adaptability, Reliability and Economy

Sized Brick Make Tight Jobs

ARMSTRONG'S and Nonpareil Insulating Brick are machine sized. They are uniform in dimensions and have smooth faces and straight edges. When you lay them up, the curves run straight and even, and the joints are so close that a film of cement seals them tight. Tight joints mean fewer heat leaks—better insulation.

Machine sizing saves you money, too, on your insulation. You get no warped, crooked, or off-size brick to sort out, trim, or throw away. They lay up faster—save waste of time and loss of material. Ask your mason. He knows what machine sizing means on the job.

Armstrong's and Nonpareil Insulating Brick are made in all standard fire brick shapes and sizes—every shape (except circles) machine finished and sized to accurate dimensions.

Write for sample brick—either or both, to the Armstrong Cork & Insulation Co., 918 Concord Street, Lancaster, Pennsylvania.

Armstrong's and Nonpareil Insulating Brick

For Furnaces, Ovens, Kilns, and Lehrs

Do You Have a Farrel-Birmingham Rolling Mill on your Payroll?

ABOVE—End View of 14" x 24" Mill

BELOW—Front View of 14" x 24" Mill

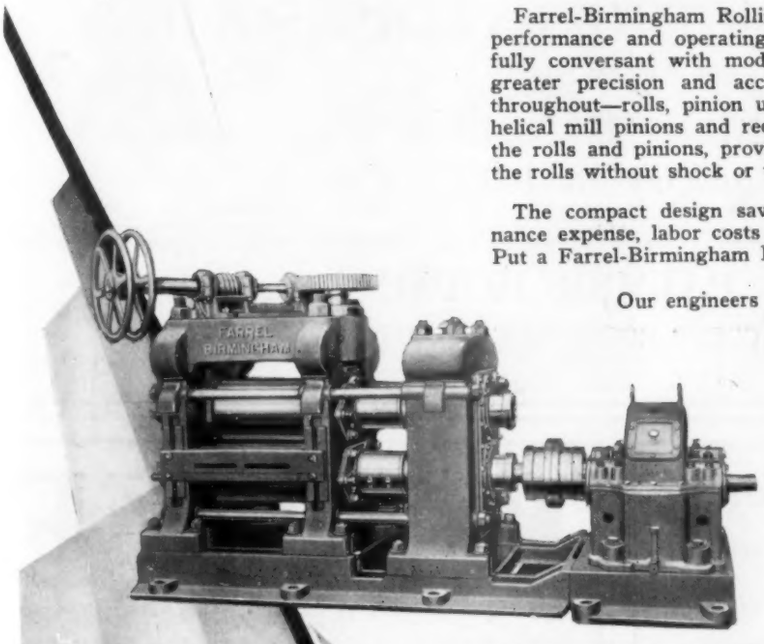
When you employ new help in your organization, you select men of high caliber—capable, efficient and experienced men whose knowledge and ability will serve you best.

But what about your shop equipment—do you consider the merits of the machine—the design, construction, power consumption, maintenance cost, production, operating economies, safety and labor-saving features? These are the things you should look for in your Rolling Mills. Remember that the machine is just as important as the man, and should be selected with even greater care, because of the larger investment involved.

Farrel-Birmingham Rolling Mills have established a higher measure of performance and operating economies. Designed by engineers who are fully conversant with modern metal rolling practice. Constructed with greater precision and accuracy. Equipped with anti-friction bearings throughout—rolls, pinion unit, and gear reduction. Farrel-Sykes double helical mill pinions and reduction gears, with universal joints connecting the rolls and pinions, provide smooth, efficient transmission of power to the rolls without shock or vibration.

The compact design saves floor space. Power consumption, maintenance expense, labor costs are reduced—production and profits increased. Put a Farrel-Birmingham Rolling Mill on your payroll.

Our engineers are at your service—consult them.



MANUFACTURERS OF

Heavy Machinery and Chilled Rolls.
Rolling Mills and Other Rolling Mill Equipment.
Roll Grinding Machines.
Farrel Indicating Calipers.
L & N Sheet Metal Working Machinery.
M & P Drop Hammers and Lifters.
M & P Blast Gates.

FARREL-BIRMINGHAM COMPANY Inc.

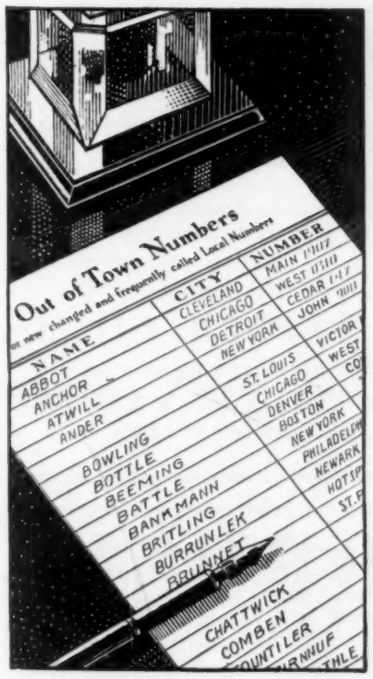
ANSONIA, CONN.

Representatives in Principal Cities

Successor to
Farrel Foundry & Machine Co. (Est. 1848)
Birmingham Iron Foundry (Est. 1836)

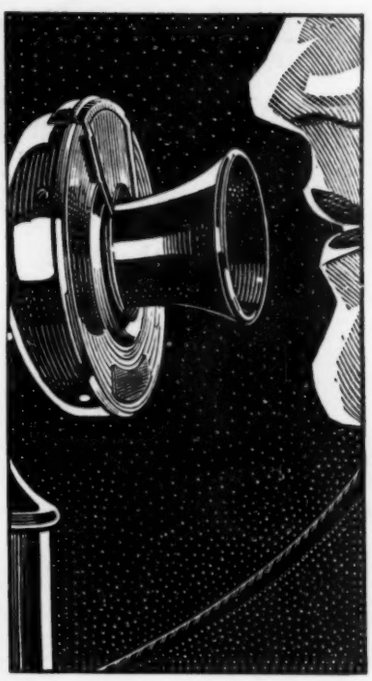
Plants
Ansonia, Conn.
Derby, Conn.
Buffalo, N. Y.

3 simple Suggestions for Telephoning between Cities



Call by number, whenever you can

Call during the less crowded hours of the business day



Speak distinctly and directly into the mouthpiece

HERE are three simple suggestions that are almost sure to help you in getting the most out of your telephone calls between near and distant towns.

Call by number, whenever you can; it will save your time. It is useful to know the number, especially for calls that you may make frequently. "Information" will gladly give you the number of any person or concern you wish, so that you can make a note of it for the future. It is a convenience to your customers to print your own telephone number on your letterhead.

Make your calls when the men you want to reach are likely to be less busy. Try calling before 9.30 in the morning, between noon and 2, or shortly after 4.

Third, speak distinctly into the telephone, keeping your lips close to the mouthpiece. A natural speaking voice such as you use in talking to a man across your desk makes distant calls as clear as local calls.

Remembering these three points will make your telephone service easier and better than ever.

Inter-city calls are ideal for making appointments. Following up visits. Clearing away misunderstandings. Completing buying and selling transactions. Bell Telephone Service is *Convenient . . . Economical . . . Universal.*

BELL SYSTEM
AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES

LATHES

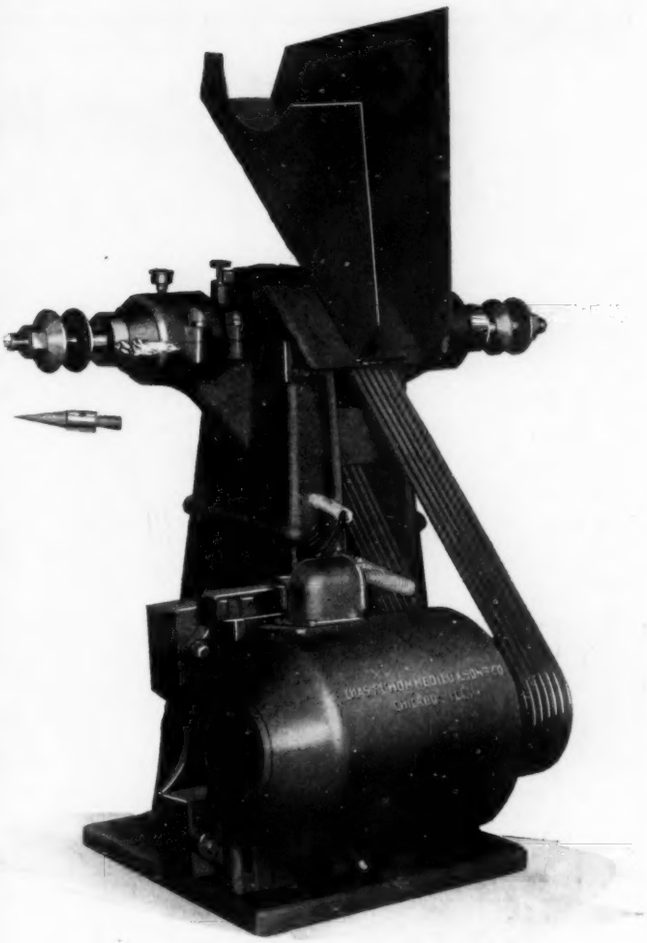
What the RELIANCE V-BELT DRIVE means to the polishing foreman:

1. A compact, efficient, independent unit.
2. Any desired speed with alternating current.
3. Quick change of speed to meet new conditions.
4. Ability to stand up under heavy loads.
5. Continuous operation.

THERE ARE NO FAST WEARING PARTS.

The belts eliminate vibration by absorbing the shock of sudden load changes.

When a bearing or belt does wear out it can be replaced on the spot in a few minutes.



RELIANCE No. 12
5, 7½ and 10 H. P.

RELIANCE No. 16
3 and 5 H. P.

Ask for Equipment Bulletin No. 105.

L'HOMMEDIEU

CHAS. F. L'HOMMEDIEU & SONS CO.

General Office and Factory:
4521 OGDEN AVENUE

MANUFACTURERS
CHICAGO

Salesroom:
37 SO. CLINTON ST.

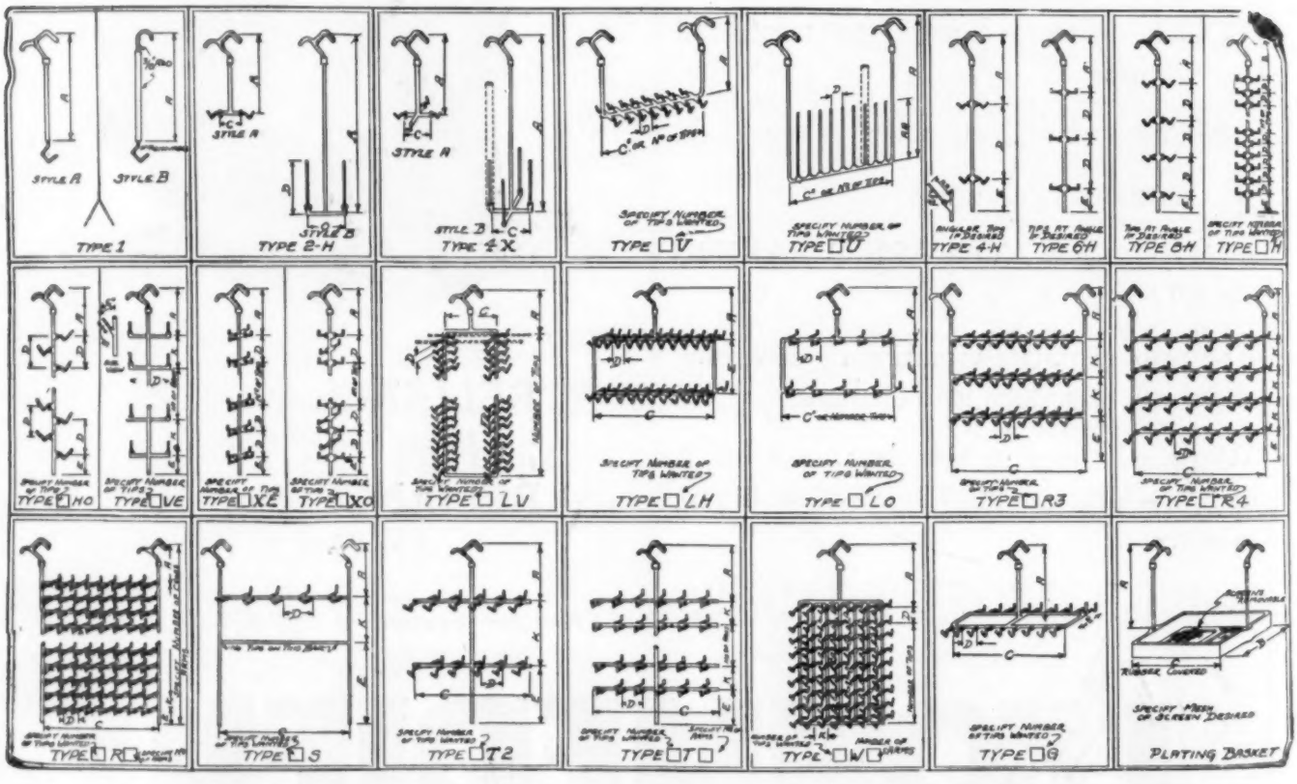
DEALERS IN PRINCIPAL CITIES

Complete Plating Plants Installed.

BELKE BETTER METHODS

Belke Soft Rubber-clad Racks

NOW it's soft rubber for the insulation on Belke Rubber-clad Racks. This provides the same insulation as hard rubber over the spines, and it gives you a composition that, because it is soft, will not crack, break or chip. It can be dropped without injury. The pliable rubber means economy in many kinds of solutions. Have a sample made up the next time a rack is needed. Don't overlook this new and practical Belke development.



The Biggest Money-saver in the Plating Department

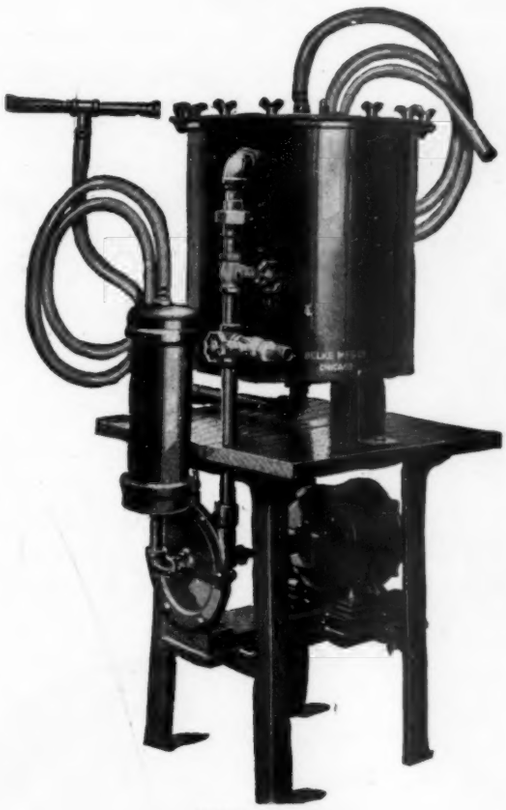
THAT'S what Belke Rubber-clad Racks are—the biggest money saver in the plating department. With Belke Racks you need not be constantly buying new racks to displace the ones which have gone out of commission. Belke Racks can't be worn out. A re-covering from time to time makes them as good as new. Think what that saving means to your plating room! Many plating plants have reported Belke Racks have paid for themselves in ten days in good dollars and cents savings and profits. That's what you want. Then make sure that Belke Racks are doing this for YOU! Belke Racks re-covered FREE for six months. Belke patented tips permit you to fit your racks to any kind of work. And remember, these are advantages that mean profit that you can get only on BELKE Racks.

BELKE MANUFACTURING COMPANY

321-26 South California Street, Chicago

BELKE BETTER METHODS

Belke Stationary Filter



STYLE BSMF

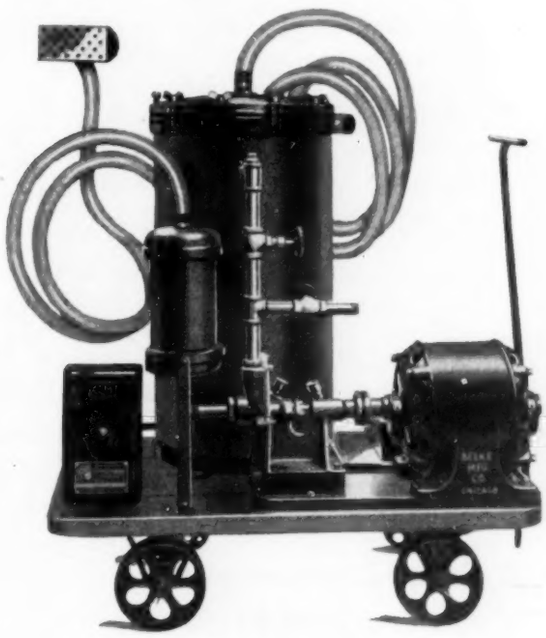
THIS filter is designed to be used continuously in a fixed location on a plating tank. It is amply sufficient in capacity to take care of the average sized plant—having a capacity of filtration of 300 to 400 gallons per hour.

This filter is exceptionally well equipped. A Century motor, an all-bronze pump, piped for direct use of the pump independent of the filter, make an outfit unequaled for time and labor saving handling of solutions about the plating room.

The intake nozzle is on a hose and is moved daily so that no part of the bottom remains dirty. The solution is forced through a series of filter discs under 20 lbs. pressure and comes out wonderfully clear and clean. The price is low. Write for bulletin.

The Most Practical Portable Filter Ever Built

BELKE Filters are undoubtedly the greatest filter values offered in America. They are dependable, and always clean the solutions, and keeps them clean—and in doing so circulate the solution at a uniform density and temperature that prevents it from going stale. The Belke Portable Filter is one of the most useful pieces of equipment in the plant. It can be moved from tank to tank. This equipment filters at the rate of 1000 gallons per hour. We recommend this filter for work where continuous filtration is wanted. Write for bulletin.



BELKE MANUFACTURING COMPANY

321-23 South California Avenue, Chicago

Always Better—the BELKE Motto!

A new Belke Factory needed to meet the growing demand

Practical Electro Plating Equipment for Dependable and Profitable Operation

W. E. BELKE knows the plating business from the plating room side. First, he is a practical electro plater; and second, he is a manufacturer. Working in plating rooms, facing the daily problems of platers, and seeking ways to do better work, at less cost, in less time, and to cut down waste and increase net profit, he devised equipment to meet conditions. He thoroughly tested out these ideas and devices—not behind a desk and on paper, but among the tanks and sulphuric fumes. His methods produced such remarkable results that he determined to give the industry the advantage of a new line of better plating equipment. The result was the Belke Manufacturing Company — the Belke Conveyor, Belke Filters, the Belke Rheostat—and a line of some twenty practical devices that are speeding the work and lengthening the profits of progressive platers on four continents. A few of the Belke specialties are advertised in these pages. Write for catalogs covering any equipment in this list that interests you.

BELKE MANUFACTURING COMPANY

321-23 South California Avenue, Chicago

ACID-PROOF TANKS

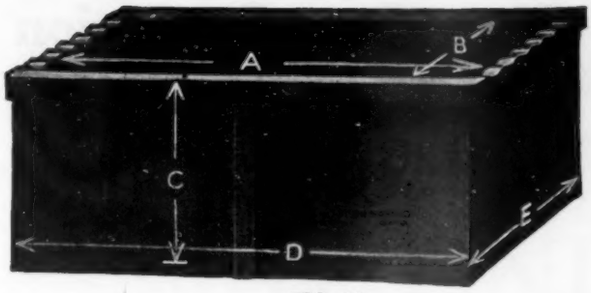


FIG. 92

Made of ONE-PIECE, thoroughly vitrified and well glazed acid-proof chemical stoneware; unqualifiedly recommended for electroplating, galvanizing and pickling work.

Unconditionally guaranteed by America's oldest and strongest manufacturers of acid-proof chemical stoneware to be acid and corrosion proof throughout the body *with or without the glaze.*

TABLE OF SIZES

Gal.	Length	Width	Depth	Weight	Code Word	List Price
4	12"	9"	9"	30	GAMUT	$10.00
10	16	12	12	60	GARB	16.00
16	20	16	12	83	GEAR	22.50
26	24	16	16	150	GENUS	29.50
38	28	20	16	186	GIPSY	45.00
41	24	20	20	197	GLADE	46.00

TABLE OF SIZES

Gal.	Length	Width	Depth	Weight	Code Word	List Price
44	32"	20"	16"	265	GLAND	$55.00
66	32	24	20	330	GLOSS	68.00
69	40	20	20	365	GRADE	74.00
104	36	28	24	438	GRANT	100.00
119	48	24	24	575	GROAT	109.00

Special sizes made to order. List prices subject to discount.

ACID-PROOF POTS

Fig. 88

Each pot is unconditionally guaranteed:

1. to be acid, alkali and corrosion proof throughout the body,—*with or without the glaze.*
2. to be more heat resistant than any other.
3. to give full and complete satisfaction in every respect.

Size	C	A	Code Word	List Price
5 Gal.	11	14	JACK	$6.00
10 Gal.	14	16	JEAN	9.50
15 Gal.	14½	21	JENA	12.00
20 Gal.	16½	23	JEWEL	14.00
25 Gal.	18	23	JOVE	17.00
30 Gal.	18	28	JURY	20.00
40 Gal.	22½	24	JUTE	24.00
50 Gal.	24	26½	JUNO	31.00
60 Gal.	24	31½	JOWL	40.00

All dimensions in inches. Covers also available. Larger sizes up to 300 gal. Outlets also provided where necessary. List prices subject to discount.

ACID PITCHERS

Fig. No. 124

Ours are made of guaranteed acid-proof chemical stoneware, are strong and rugged,—with long pouring lips and well fitted handles.

Size	Code Word	List Price
2 Qts.	MARK	$1.20
1 Gal.	MILD	1.40
2 Gal.	MOON	2.10

List prices subject to discount.

DIPPING BASKETS

Fig. 114

Fig. 114A

Size	C	B	Holes	Code Word	List Price
2 qt.	5¾	6½	⅛"	WAD	$3.50
4 qt.	7¼	7¾	¼"	WAG	4.50
6 qt.	8	9	⅜"	WAN	5.50
8 qt.	9¼	9¼	⅜"	WAP	6.50
10 qt.	10¾	11	½"	WAR	7.50
12 qt.	11¼	11½	½"	WAW	8.50

List prices subject to discount.

Size	C	B	Holes	Code Word	List Price
2 qt.	7⅛	5	⅛"	WEB	$4.00
4 qt.	9	5¼	¼"	WED	5.00
6 qt.	10¼	6½	⅜"	WEE	6.00
8 qt.	11	7¼	⅜"	WEN	7.50

List prices subject to discount.

These Dipping Baskets are made of strong, sturdy, non-porous, thoroughly vitrified and well glazed acid-proof chemical stoneware,—a high quality product. No possible comparison should be attempted with cheaper and inferior varieties made of common stoneware. Because of their longer life and superior service, our Dipping Baskets are invariably preferred by all of the larger plating establishments.

THE U. S. STONEWARE CO.

38 Church St. New York, N. Y.

U.S. STONEWARE ACID PROOF

"U.S. Shows Up Best"

"WELL, Chief, we've made those records you asked for. We made them from tests with various makes of buffers over a long period and find you can't match U. S. Buffers on several points. Here they are: (1) They maintain their rated speed under load with minimum current requirements and with least reduction in speed—making for maximum production. (2) Their superior bearing equipment and rugged construction make for constant operation and lowest maintenance cost. (3) Proper distribution of metal makes for better balance and freedom from vibration."

Let us acquaint *you* with some of the many large users of U. S. Buffers, and with what *you* may expect from these machines. Ask your jobber or write us.

"The Good Mechanic's Choice"

U. S. Buffing Machine (*Heavy Duty*)

Equipped with powerful motor built to A.I.E.E. standards for continuous heavy duty service at full load with temperature rise of 40 degrees; four heavy duty SKF Ball Bearings in dust-tight housings; heavy chrome-manganese alloy steel spindle; remote control with overload protection and no voltage release; push button on motor frame; locking device for holding shaft while changing wheels, etc., etc. Made in 7 sizes—2 to 20 H.P. inclusive. Write for details.

THE STANDARD OF QUALITY SINCE 1897

THE UNITED STATES ELECTRICAL TOOL COMPANY

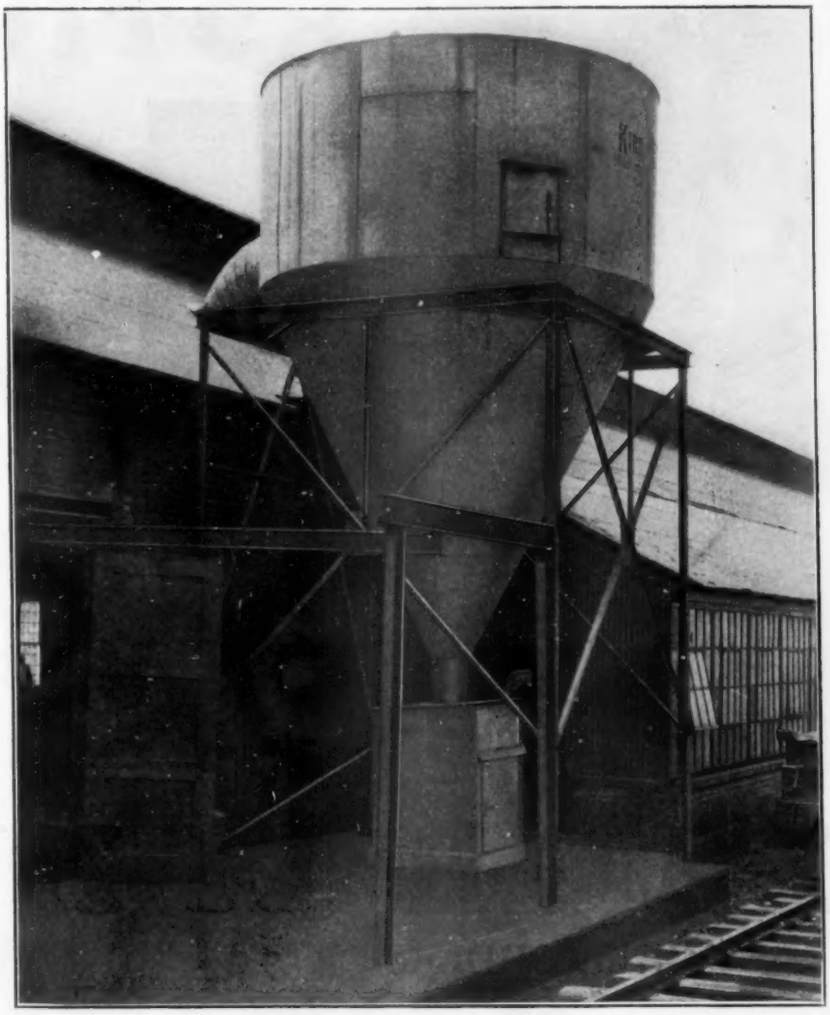
Oldest Builders of Electric Drills and Grinders in the World

2462 West Sixth Street — Cincinnati, Ohio, U.S.A.

Atlanta	Cleveland	Detroit	New York	St. Louis
Boston	Dallas	London	Philadelphia	San Francisco
Chicago	Denver	Minneapolis	Pittsburgh	Syracuse

Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York City

Canadian Division—MAPLE LEAF ELECTRIC TOOLS, Ltd.—Toronto



Alleghany Steel Co., Says:—

"Results Have Justified Your Guarantees And Exceeded Our Expectations"

"Before a Kirk & Blum Dust Collecting System was installed in our sheet steel polishing department during the latter part of 1928, the dust was so dense that it endangered the health of our employes and the efficiency of our motors and machinery.

"Kirk & Blum engineers studied our dust problem and gave definite guarantees as to maximum power demand and minimum suction. Results have justified these guarantees and exceeded our expectations."

"The K. & B. Dust Collecting System paid for itself in a year's time by reduced wear and tear on motors and machinery, better health of employes and increased production.

"We installed K. & B. equipment because of its efficient design and superior engineering. All pipe fittings are brought in at small angles and their scientific tapering and smooth joints deliver a uniform suction and reduce resistance. The system operates 24 hours a day."

Gould Report No. 910.

KIRK & BLUM
Blower Systems

The K & B book "Blower Systems" describes approved design and application of dust collecting equipment in wood-working and metal-working plants, glass, chemical, and other industries. Write for your copy.

THE KIRK & BLUM MFG. CO.
2859 Spring Grove Ave., Cincinnati
Detroit Factory and Office: 4718 Burlingame

Pittsburgh Representative: The Bushnell Mchy. Co., 1501 Grant Bldg.
Louisville Representative: Liberty Blow Pipe Co., Inc., 917 S. 12th St.
Canadian Representative: Canadian-Rogers Ltd., Winnipeg and Toronto

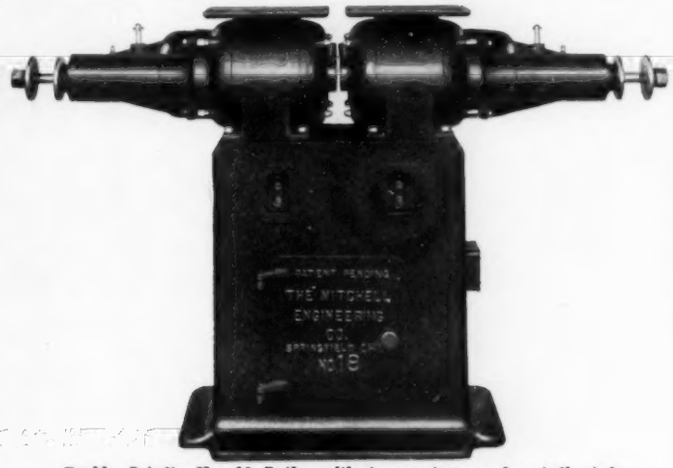
MITCHELL LATHES

With the Incomparable

HERRING-BONE GEAR DRIVE

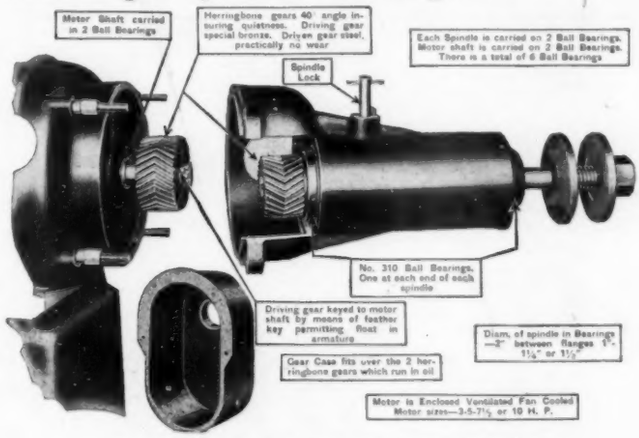
A far-reaching improvement over the old type lathe. The Herring-Bone Gear Drive obtains noiseless and perfect transmission of power and lengthens the life of the machine. Offered in both the Single Spindle and Double Spindle.

Single Spindle No. 17 Lathe with one motor.



Double Spindle No. 18 Lathe with two motors, each spindle independently driven.

Details of mechanism of the Mitchell Lathe with the Herring-Bone Gear Drive exhibiting its peculiar advantages:



Exposed View of Gear Drive and Spindle Assembly.

A.—Noiseless Operation
Insured by Herring-Bone Gear Drive.

B.—Saves Power
Gears deliver 98% of total power to wheels.

C.—Outlasts All Other Types of Drive
—many times over. Due to materials used and to the extreme accuracy of the gears.

D.—Each Spindle Independent
—and quickly removable.

E.—Vibration Eliminated
Motor shaft carried in two ball bearings independent from the spindle bearings.

F.—Driving Gear Feather Keyed
—to motor shaft. Rotor always floats to its magnetic center.

G.—Infrequent Oilings
Gears encased and run in oil.

H.—Ideal for Operator
Straight line front—cutting edge of wheels far out from front of machine.

Send for descriptive folder.

Exclusive Distributors

Frederic B. Stevens, Inc.

Foundry Facings, Supplies and Equipment — **Face Brick and Fire Brick**
Buffing Compositions, Platers' and Polishers' Supplies and Equipment

NEW ENGLAND
New Haven, Conn.
51 Chestnut Street

Corner of Larned and Third Streets
DETROIT, MICH.

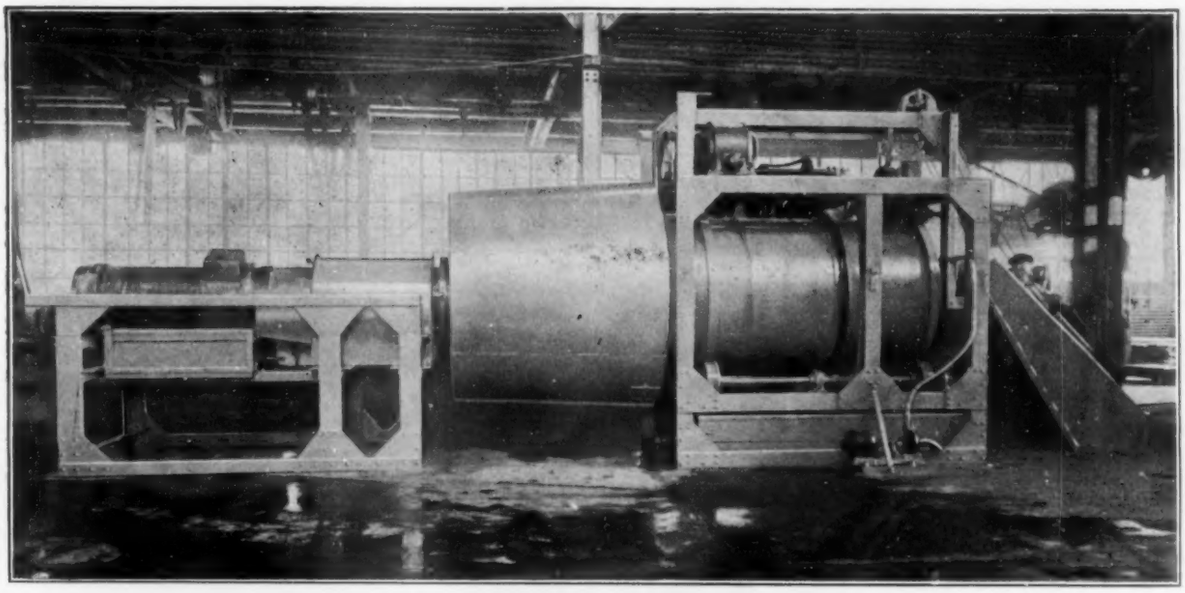
PENNSYLVANIA
Erie, Pa.
242 West Twelfth Street

INDIANA: Hoosier Supply Co., 36 South Cruse Street, Indianapolis, Ind.

FREDERIC B. STEVENS OF CANADA, LTD.

Warehouse, Facing Mills and Buffing Compositions Factory
WINDSOR, ONT., 926 McDougall Street

Office and Warehouse
TORONTO, ONT., 139 Royce Avenue



The Problem of the Manufacturer of Galvanized Hardware

For twenty-two years the James Mfg. Co., Fort Atkinson, Wisc., nas been making "Jamesway" barn equipment. Pioneering in the modernization of the farming business it has eliminated the scum-covered drinking tank by the pump—has closed the rat play grounds —has brought sanitation to cattle quarters.

This it has done in part by manufacturing for the farmer the finest quality of equipment. It controls the quality by making everything in one plant. It found that galvanized parts and fittings resisted ammonia better than enamel finish. Also it discovered that in its production line the section between foundry and zinc kettles was the neck of the bottle.

The Ideal Acid Tumbling unit shown above was inserted and W. D. James, President, writes:

"The acid mill is doing good work on castings and small steel parts. There is no question but what it speeds up the pickling production a great deal. It is possible to remove sand and scale from castings with the use of this equipment without sand blasting. So we look upon this installation as a marked improvement, so far as speeding up of the work is concerned, because we do not have to handle small castings, etc., individually."

This standard 48" x 84" Ideal Barrel handles grey iron and malleable castings as well as drop forgings. From a lead-lined tank under the first unit an acid-proof pump forces acid over the work being tumbled.

As the work is discharged from the barrel it is rinsed by cold water sprays in a revolving screen.

It automatically passes into an Alcumite screen which drenches the parts with a 10% muriatic acid flux solution contained in a rubber-lined tank. After this operation the work is dried over the hot plate and is ready for galvanizing.

IDEAL
TRADE MARK REG. U.S. PAT. OFF.

Engineering Service

Problems of removing scale, chips and fins from castings and forgings — of scrubbing, rinsing and drying stamped and drawn parts, removing grease, oil and chemicals—are special problems. Our Engineering Service involves a study of your particular problem and the application of automatic equipment to solve it, *at a considerable saving in labor*. Our engineers will gladly examine your situation — asking them to do so will incur no obligation.

Put it up to Specialists.

N. Ransohoff Incorporated

West 71st Street at Millcreek, Carthage, Cincinnati, Ohio

BAIRD

Double Oblique Tilting Tumbler

This is the Baird No. 2 Double Machine equipped with No. 28 wood and cast iron barrels. Each barrel works independently of the other and each is thrown in and out of action by separate friction clutches. Send for Bulletin 300.

There is a Baird Tumbling Barrel that will meet your particular requirements to the letter. During our sixty years of specializing in the production and finishing of small parts made of wire and ribbon metal, we have developed barrels to meet every possible condition. Whatever your problem in cleaning or finishing, it will pay you to

"Ask BAIRD About It"

THE BAIRD MACHINE COMPANY BRIDGEPORT, CONNECTICUT

BAIRD TUMBLING EQUIPMENT

In addition to making all types of tumbling outfits, The Baird Machine Company is the world's leading designer and builder of Automatic Machines to produce articles from wire and ribbon metal.

Specialists designed it . .
Engineers tested it . . .
Results proved it . . . . . .
. . and users say,
"Yes — the Rite-Speed is the answer to the old problem"

The Rite-Speed Electric is the answer to the old problem of obtaining the desired and the right speed. Hammond Machinery Builders foresaw the need of building a self-contained electric polishing and buffing lathe for alternating current service, with spindle speed practical for average work.

Efficient polishing speed is usually 2000 to 2400 and for buffing 2400 to 3000 R.P.M. It is impossible to obtain these efficient speeds with "motor-on-spindle" type polisher, unless large expenditures are made for auxiliary speed control equipment.

With the Rite-Speed—any speed desired can be had. The Multi-V Belt Drive, which is silent, non-slipping, and long lived, transmits the power from the motor to the spindle.

The Rite-Speed insures the utmost in production, elimination of dangerous inefficient overhead drive, and lowers maintenance cost.

Hammond Machinery Builders
INCORPORATED
Grinding, Polishing & Sawing Machinery
KALAMAZOO, MICHIGAN
1600 Douglas Ave.

Write for Literature—Today

If you are in doubt as to the economies that can be effected with the use of the Rite-Speed—our Engineering Department will analyze your problem—write us.

Newest of Rite-Speed Polishing and Buffing Lathes

Overhanging Spindle Type R O

Sizes 3 to 15 H. P.

HAMMOND of KALAMAZOO

Formerly HILL-CURTIS Company

WHEN IT RAINS

HOW DOES YOUR PRODUCT STAND UP?

WITH present methods of plating, there are several ways of protecting your product against the action of the elements, thereby prolonging its life and usefulness.

Plated coatings may be chromium, nickel, cadmium, zinc, copper . . . or a combination of several metals. Each has its place in adding to the beauty of your product and protecting the base metal against corrosion.

Modern equipment and improved methods have reduced the cost of plating to a point where it can be economically applied to practically any metal product. As a matter of fact, the plating costs for hundreds of metal articles used in everyday life is but a small percentage of their selling price.

HANSON-MUNNING PRODUCTS
Polishing Machines, Lathes, Plating Equipment, Generators, Barrels, Tanks, Wheels, Abrasives, Buffs, Brushes, Compositions, Cleaners, Anodes and Salts

HANSON MUNNING

Leading manufacturers of polishing and plating equipment and supplies
Hanson-Van Winkle-Munning Co., Matawan, N. J., and Chicago

2984

A STANDARD FOR 35 YEARS

Thirty-five years ago ACME WHITE was the only lime buffing composition used commercially in the United States. Today it is the largest selling lime composition in the world. During these years ACME WHITE has been used in all types of buffing operations—under all sorts of conditions. The results have always been the same—a uniformly beautiful, mirror-like finish at a low cost per piece buffed

ACME WHITE

HANSON-MUNNING PRODUCTS
Polishing Machines, Lathes, Plating Equipment, Generators, Barrels, Tanks, Wheels, Abrasives, Buffs, Brushes, Compositions, Cleaners, Anodes and Salts

HANSON MUNNING

Leading manufacturers of polishing and plating equipment and supplies

Hanson-Van Winkle-Munning Co., Matawan, N. J., and Chicago

3067

These Spoons sell two for *5 cents* - - -

YOU can buy them in any of the larger chain stores, chromium plated.

What has this to do with your business? Spoons probably have nothing to do with it. But these spoons tell an interesting story. For by applying chemical engineering to the process of chromium plating, the Hobson Flatware Company has been able to cut the plating cost to 14¢ per gross—less than the cost of the nickel plate formerly used.

Here is a typical example of production cost cutting resulting from the application of our specialized knowledge and experience in chromium plating.

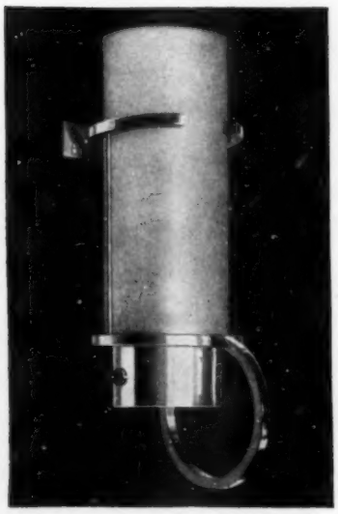
The price tag on these spoons is significant of other achievements where we have been called in to solve difficult problems. It is typical of what is going on in the many plants that have employed our services—and every plant proud of its achievements—and ours.

Your problem may be a different one. But whatever it is,—if it involves any phase of production or process,—we shall welcome the opportunity to study it.

An outside viewpoint is a valuable means of getting at the inside of a problem.

WEISBERG & GREENWALD
ENGINEERS—CHEMISTS
71 West 45th Street, New York City

Chromium Plate and Porcelain Waffle Set, courtesy of Robeson Rochester Corp.



Modernized Lighting Fixture, courtesy of Lord & Taylor, New York.

CHROMIUM blends in!

The combination of Chromium Plate with other materials such as Porcelain, Glass, Bakelite, etc., provides many new ideas in the metal and electrical industries.

The public KNOWS Chromium Plate. Knows how it keeps its color . . . requires no polishing . . . retains its beauty. Progressive manufacturers are stepping out with Chromium Plated merchandise of the finest quality. Its acceptance is assured . . . proved!

United Chromium, Inc., renders a valuable licensing service assuring manufacturers of the finest Chromium Plate on a definite production basis. It would be a pleasure to explain details of this service. Names of our jobbing licensees will be sent to manufacturers whose present needs do not justify their own plating department.

UNITED CHROMIUM

INCORPORATED

Executive Office: 51 East 42nd Street, New York City

Chicago, Ill. ◆ *Cleveland, O.*

Detroit, Mich. ◆ *San Francisco, Calif.* ◆ *Waterbury, Conn.*

Cordial Greetings and Best Wishes for Prosperity in 1930 from R&H

THE NEW YEAR records the attainment of another milestone in the development of the chemical consuming industries . . . a growth reflected in the increased activity of R & H, and the expansion of facilities necessitated thereby.

R & H has always sought to deserve the confidence and good will displayed toward the firm by Industry. So, in our new quarters, into which we moved in May, we face the New Year with a strengthened belief in our ability to serve you even more competently.

To our friends and patrons we express our appreciation of their courtesy and cooperation . . . and extend to all the greetings of the season and cordial good wishes for continued prosperity.

The
ROESSLER & HASSLACHER CHEMICAL CO.

10 East 40th St., New York, N. Y.

down to BRASS TACKS for a change

WE'VE been having a good time with ALAKA ads. We've been making fun of lacquer troubles . . . because our customers laugh at them too!

But it's time to be serious for a change. This is a busy season, and you need your lacquer *right*. This is no time for foolishness!

Maybe you don't know what the shooting's all about? . . . Maybe you've never tried ALAKA? (Write for samples, now!) Here's the dope:

(1) In ALAKA the high solid content (cotton, gum and plasticizer) is properly proportioned and balanced. That's the reason for the toughness and durability of the ALAKA film . . . the why and wherefore of ALAKA'S superior coverage.

(2) In ALAKA the solvents are blended accurately with respect to vapor pressure and boiling point. That's what gives ALAKA the proper flow-rate making it spray and dry smoothly without streaking, crazing, gooseflesh, pimples or what have you.

(3) All raw materials are analyzed by our own laboratory to check their uniform quality in accordance with our prescribed standards. Under scientifically controlled production it is not strange that laboratory tests of ALAKA before it is packed in drums for shipment should prove our point of guaranteed uniformity . . . that makes ALAKA dependable always.

ALAKA gives a finish that wears like an aviator's shoes! ALAKA *sells* your goods. AND KEEPS THEM SOLD!

No rejects, no returns, no red-ink accounts on account of finishing troubles when you're using ALAKA . . . the lacquer without a headache for your foreman—at the price you *want* to pay.

Let's prove it. It's easy. Write for samples and put them through the mill . . . You'll be laughing at lacquer troubles too. Do it today.

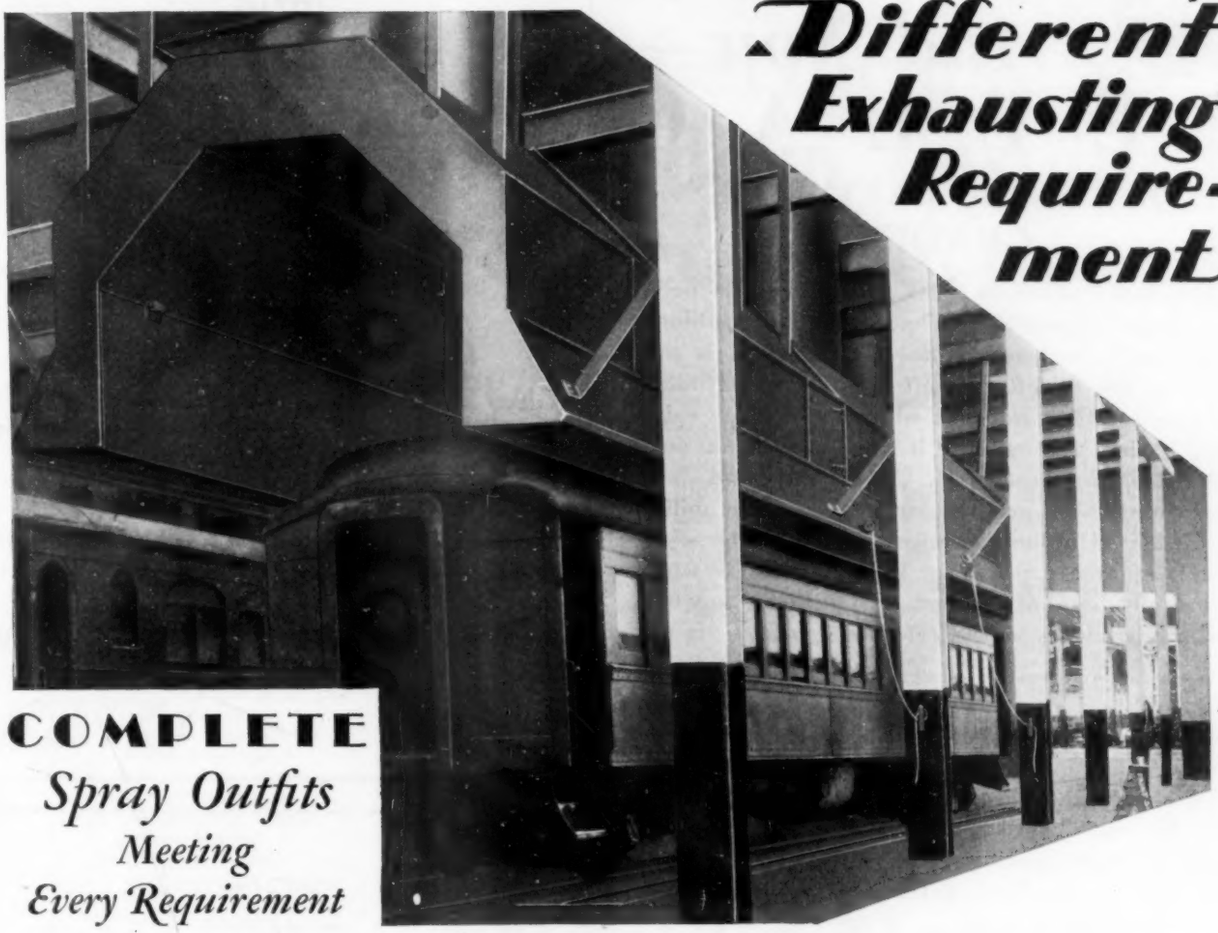
UNIFORM *DEPENDABLE* *PRACTICAL*

LACQUER & CHEMICAL CORP.

214-222 40th ST.~BROOKLYN N.Y

CHICAG *makers of* **ALAKA** **PHILADELPHIA**

De Vilbiss Meets Every Different Exhausting Requirement



COMPLETE *Spray Outfits Meeting Every Requirement*

EVERY painting and finishing operation is served by specialized DeVilbiss spray outfits which are designed and built to do the particular work for which they are intended with the maximum economy of labor and materials.

Whatever may be your painting or finishing operation, look to DeVilbiss for:

Spray guns of various types and sizes.

Pressure feed paint tanks and containers.

Spray booths, exhaust fans, and approved lighting fixtures.

Air compressing equipment.

Air transformers and accessories.

Air and fluid hose and connections.

Complete outfits from the smallest hand-operated units to the largest industrial installations.

Write for catalog of the DeVilbiss spray equipment that fits your individual need.

EVERY different operation and industry engaged in spray-painting and spray-finishing presents different exhausting problems—often different plants or departments of the same general character demand highly individualized installations of exhausting equipment.

Specialized engineering ability, a long and vast experience with exhausting equipment in all industries, and an intimate, proved knowledge of the essential needs of every separate exhausting problem make it easy for DeVilbiss to provide maximum efficiency with the minimum of cost no matter how large or small, peculiar or different the exhausting requirement may be. It costs you nothing to learn how DeVilbiss can serve you in this particular. It may save you much.

DeVilbiss Spray-PAINTING FINISHING System

THE DEVILBISS COMPANY , 266 PHILLIPS AVENUE , TOLEDO, OHIO

Sales and Service Branches:

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS SAN FRANCISCO WINDSOR, ONT.

Direct factory representatives in all other territories

The Blue Knight's Column

For a while it seemed really true; that *everybody* could be rich.

Then the paper-house market collapsed, and an old lesson was taught once more: Don't buy quotations —BUY VALUES!

For all firms who sold VALUE and bought VALUE, 1929 has been a marvelous business year. We can't let it slip by without expressing our heartfelt appreciation to our customers in many industries to whom we have been of mutual VALUE.

The crash is over—let's forget about it, but not the lesson: Don't buy quotations—BUY VALUES —even in lacquer. In 1930 buy values that endure.

Merry Xmas to You All

ROXALIN FLEXIBLE LACQUER COMPANY, Inc.
105-9 Seventh Ave., L. I. City, New York

Write to our Service Department for any of the Research Bulletins listed below, prescribing a series of solutions to important lacquer problems . . . or for an interview with one of our executives on your problems.

- ☐ No. 21 — About Flexible Lacquers for Brass, Aluminum and Nickel Silver.
- ☐ No. 23—About the one coat color backgrounding of etched name plates.
- ☐ No. 24—About Wood cement for Lacquer finished furniture.
- ☐ No. 26—About a Non-Jellying Bronzing Lacquer.
- ☐ No. 27—About a Tarnish-Proof Lacquer for Silver and Brass.
- ☐ No. AB—About a Flexible Finish for Cork and Tile Flooring.

The best cleaning job they had ever seen

THE thorough removal of cupping oil from small brass parts proved to be a problem in one eastern shop. A number of different compounds were tried, but none was entirely satisfactory.

Then the nearby Oakite Service Man was called in to show what Oakite materials would do. A mild solution of OKEMCO, a new heavy-duty cleaner, was made up in a heated vat. A basket of parts was dipped in and sloshed around for only a minute and a half. Results were perfect. The foreman said it was "the best job he had ever seen done with so little material."

In your plant, too, Oakite materials and methods can effect speedy, thorough cleaning, that will save time and lower costs. A card to us will bring our nearest Service Man, who will gladly go into details. No obligation.

Manufactured only by

OAKITE PRODUCTS, INC., 18 Thames St., New York, N. Y.

Oakite Service Men, cleaning specialists, are located at

Albany, N. Y., Allentown, Pa., *Atlanta, Altoona, Pa., Baltimore, Birmingham, Ala., *Boston, Bridgeport, *Brooklyn, N. Y., Buffalo, *Camden, N. J., Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, O., Decatur, Ill., *Denver, *Des Moines, *Detroit, Erie, Pa., Fall River, Mass., Flint, Mich., Fresno, Cal., *Grand Rapids, Mich., Harrisburg, Pa., Hartford, *Houston, Texas, *Indianapolis, *Jacksonville, Fla., *Kansas City, Mo., *Los Angeles, Louisville, Ky., Madison, Wis., *Memphis, Tenn., *Milwaukee, *Minneapolis, *Moline, Ill., *Montreal, Newark, N. J., Newburgh, N. Y., New Haven, *New York, *Omaha, Neb., *Oakland, Cal., Oklahoma City, Okla., Oshkosh, Wis., *Philadelphia, Phoenix, Ariz., *Pittsburgh, Pleasantville, N. Y., Portland, Me., *Portland, Ore., Poughkeepsie, N. Y., Providence, Reading, Pa., Richmond, Va., *Rochester, N. Y., Rockford, Ill., *Rock Island, Sacramento, Cal., *San Francisco, *Seattle, South Bend, Ind., Springfield, Mass., *St. Louis, *St. Paul, Syracuse, N. Y., *Toledo, *Toronto, Trenton, *Tulsa, Okla., Utica, N. Y., *Vancouver, B. C., Waterbury, Conn., Williamsport, Pa., Wichita, Kan., Worcester, Mass.

**Stocks of Oakite Materials are carried in these cities*

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

ANACONDA
from mine to consumer

Sheet Anodes of Anaconda Brass and Bronze are produced under the same high technical standards that characterize all Anaconda products comprising Copper, Brass, Bronze and Nickel Silver in all varieties of sheets, wire, rods, tubes and special shapes.

ANACONDA
COPPER ANODES
for
every requirement

ANACONDA Copper Anodes are made with the highest metallurgical skill by the world's largest copper-producing organization. Complete supervision of every operation from mining the copper ore to forming the metal into Anodes, assures uniform corrosion and minimum scrap losses. The complete line of Anaconda Copper Anodes includes:

Anaconda Oval Copper Anodes

Anaconda Oval Copper Anodes are rolled to cross sections of approximately 3", 3½" and 4" by 1⅛" to 1½" and supplied in stock lengths or cut to length as specified.

Anaconda Hot Rolled Copper Anodes

Formed from high oxygen Anaconda Copper over 99.925 per cent pure, with total metallic impurities of less than 0.01 per cent. Rolled Anodes are produced flat and accurate to dimensions.

Anaconda Electro-Deposited Copper Anodes

The American Brass Company also produces Anodes made by the electrolytic process (sometimes known as "Cathode Anodes"). These have a purity of 99.99 per cent and are preferred by some electroplaters for certain types of plating.

All Anaconda Anodes are furnished with suspension holes drilled as desired.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
Offices and Agencies in all Principal Cities
Canadian Mill: ANACONDA AMERICAN BRASS LTD
New Toronto, Ontario

ANACONDA
COPPER ANACONDA BRASS

DIRECTORY

Copper, Brass, Aluminum and Other Metal Rolling Mills

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOT, METAL GOODS

DIRECTORY

Copper, Brass, Aluminum and Other Metal Rolling Mills

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOT, METAL GOODS

Directory of Contract Workers

CASTING, SPINNING, MOLD MAKING, CHROMIUM PLATING SPECIALTIES, ETC.

DIRECTORY

Lead and Zinc Smelters and Manufacturers

PRODUCERS OF PIG LEAD, SLAB ZINC, ZINC ROD, SHEET ZINC, ACIDS

DIRECTORY

Metal Smelters, Refiners, Dealers

PRODUCERS, ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

Professional

BUSINESS WANTS

FOR SALE—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

BUSINESS WANTS

FOR SALE—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

POLISHING —EQUIPMENT— PLATING

1—300 ampere, 6-volt Hanson & Van Winkle interpole type motor generator set.

1—700 ampere, 10-volt, Holtzer-Cabot generator.

1—1000/500 ampere, 6/12-volt, Bogue motor generator set.

1—1400 ampere, 6-volt, Holtzer-Cabot generator with full commutators and composition brushes.

3—Roth, 220-volt, direct current, variable speed motor buffing lathes.

6—No. 5 Blount ball-bearing polishing lathes with roller bearing countershafts.

Other makes of ball-bearing lathes in stock.

1—30 x 16 Abbott burnishing barrel, wood lined—first class condition.

BOSTON PLATING SUPPLY COMPANY
101 Haverhill Street, Boston, Mass.

FOR SALE

FOR SALE—Connecticut Dynamo, 1500 amp. 6-12 volt, with 15 H.P. Allis-Chalmers Motor, $400.00.
H. & W. W. Dynamo, 850 amp. 6-12 volt, with 10 H.P. Westinghouse Motor, $350.00; also Tumbling bbls.

GENERAL RUST-PROOFING CO.
20 Lorain Road, North Olmsted, Ohio.

Polishing and Plating Equipment

Plating Dynamos and Motor Generator Sets

All sizes carried in stock.
Tumbling and Plating Barrels.

Anodes	Wheels and Buffs	Steam Boilers and Gas Fired Kane and Ofeldt
Spraying Systems	Ammeters	
Polishing Lathes	Rheostats	
Plating Tanks	Voltmeters	Blower Systems

And most anything for the Plating Shop.

J. HOLLAND & SONS, INC.
489 Broadway, Brooklyn, N. Y.
Telephone Stagg 5128 and 8989.

Largest Stock of Used Polishing and Plating Supplies in America

Let us have your requirements. Entire plants or parts thereof bought for cash. Send list with prices.

LEWIS ROE LEWIS ROE LEWIS ROE LEWIS ROE LEWIS ROE

Headquarters for Used Polishing and Plating Equipment

Ammeters—Anodes—Blowers—Buffs—Dust Collecting Systems—Dynamos—Emery Wheels—Generators—Grinding Lathes—Motors—Polishing Lathes—Polishing Wheels—Tripoli—Tanks.

All machines and equipments are reconditioned in our machine shop before leaving our stores.

BUS hwick 2453

LEWIS ROE

1044-1050 De Kalb Ave. Brooklyn, N. Y.

LEWIS ROE LEWIS ROE LEWIS ROE LEWIS ROE LEWIS ROE

WANTED—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

WANTED

1—2000 Amp. 6-Volt Electro-Plating Generator, direct connected to motor, 220-volt, 60-cycle, 3 phase;

also 1—2000 Amp. 6-Volt Electro-Plating Generator, direct connected to motor, 220-volt, 60-cycle, 3 phase; 12-Volt, direct connected.

Synchronous Motors Preferred

PITTSBURGH PIPE AND COUPLING CO.
ALLISON PARK, PA.

WANTED TO BUY

Mechanical plating apparatus. 1500 Amp. Generator. Ball burnishing barrels. Lacquer spray outfit.

REESE PADLOCK COMPANY, Lancaster, Penna.

WANTED

SECOND HAND PLATING SUPPLIES, EQUIPMENT AND GENERATORS.

NEW HAVEN SHERARDIZING COMPANY
AKRON, OHIO

SITUATIONS OPEN

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

FOREMAN PLATER

SITUATION OPEN—Foreman Plater, a man thoroughly experienced in plating and finishing. Must be able to control solutions and direct help. Broad experience with Chromium and Nickel plating necessary. Location 40 minutes from New York City.

BROAD
Care of THE METAL INDUSTRY.

SALESMEN

calling on firms doing Electro-Plating to sell Brighteners for plating solutions as a side line on a commission basis. Good chance for live wire. State territory.

E. WAMBAUGH COMPANY, Goshen, Ind.

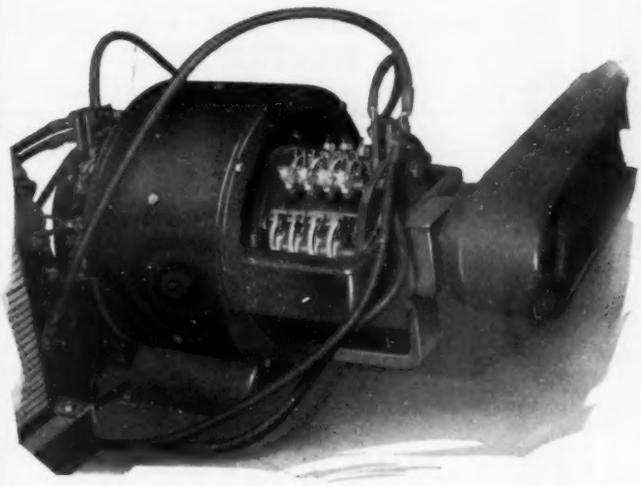
BUSINESS WANTS

FOR SALE—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

Remanufactured generators

thoroly tested and guaranteed



All generators offered by Fuerst-Friedman are remanufactured to be equal in condition, for all practical purposes, to that of new equipment. Our overhauling consists of renewing armature, commutators, bearings, field poles, brushes and brushholders. Before shipment each machine is tested under full load and commutation is carefully checked.

Regardless of what generator you choose, you will secure a perfectly operating machine at an unusually low price.

These generators can be furnished for belted drive or mounted on base with direct connected motor. If motor generator set is desired give current characteristics.

Here are values that will save you money

Amp. Capacity	Volts	Speed	Make	Excitation
50/25	6/12	1750	Munning	self excited
100	6	1200	Hertner	separate excited
100	6	1000	Lincoln	separate excited
150	6	1700	Ideal	self excited
150	6	1750	Bennett O'Connell	self excited
250	5	1000	Eddy	self excited
250	5	1300	Hanson Van Winkle	self excited
400	6	1200	Hanson Van Winkle	self excited
500/250	6/12	1750	Munning	self excited
600	3	1100	Bogue	self excited
750	6	1200	Bennett O'Connell	self excited
800/400	6/12	1100	Zucker L. & Loeb	self excited
800/400	6/12	1200	Hanson Van Winkle	self excited
1000/500	6/12	1200	Munning	separate excited
1250/625	6/12	1200	Burke	separate excited
1500/750	6/12	1200	Munning	separate excited
1650/825	6/12	1800	Burke	separate excited
2000/1000	6/12	860	Columbia	separate excited
2500/1250	6/12	900	Munning	separate excited
3000/1500	6/12	900	Eager	separate excited
4000/2000	6/12	900	Burke	separate excited
5000/2500	6/12	690	Elec. Pro.	separate excited
8000/4000	6/12	575	Hanson Van Winkle	separate excited
10000/5000	6/12	425	Munning	separate excited

Write, wire or phone for complete details. We invite personal inspection of equipment.

The FUERST-FRIEDMAN COMPANY

1292 E. 53rd St. Cleveland, Ohio

Everyone who tries a Metal Industry Want Ad gets what he wants

BUSINESS WANTS

SITUATIONS OPEN—Continued

SALES OPPORTUNITY

Chicago company, firmly established in the West, having met with excellent success in introducing product in the East during the past year, requires experienced, high grade producers to call on metal finishing trade around New York City, New England and Philadelphia. Industrial sales experience required. Address

FIRMLY
Care of THE METAL INDUSTRY.

IF YOU THINK YOU CAN HOLD A BETTER JOB

than the one you now have, or, if you are looking for a place to show your skill, put your qualifications where a needy firm may reach you. Also, keep your eyes on our Situations Open Section.

A Card in This Section Will Get You a Position Worth Having

SITUATIONS WANTED

Display Advertisements, One Column Wide, $1 per inch, Each Insertion

PRACTICAL FOUNDRYMAN

SITUATION WANTED—An expert practical foundryman, very active, experienced in aluminum, brass, who can locate and overcome trouble, hold costs to a minimum and understands short cuts in foundry practice; can handle large or sall production.

Address XXX
Care THE METAL INDUSTRY.

SITUATION WANTED

SUPERINTENDENT, at present employed, possessing the necessary qualifications wants position in brass shop in similar capacity. Large experience in many branches of brass goods, but production work preferred.

PRODUCTION.
Care of THE METAL INDUSTRY.

SUPERVISOR

SITUATION WANTED—One who has years of experience offers his services to a manufacturer requiring practical control and supervision in the plating and finishing rooms. Has broad practical experience pertaining to all branches in electro deposition of metals by the still tank—mechanical and automatic method—and maintaining solutions normal and economical. The finishing of metals and its alloys as used at present in all its various characteristic colors and shades by the wet, pigment, French, and lacquer enamel method. Has training in analytical chemistry on non-ferrous metals.

At present employed. Would prefer East.

Details and references will be promptly submitted.

SUPERVISOR
Care of THE METAL INDUSTRY.

Foundry Foreman

SITUATION WANTED—By Brass Foundry Foreman; practical molder on false core and ornamental French sand castings. Address

FRENCH SAND MOLDER
Care THE METAL INDUSTRY.

FOREMAN POLISHER

SITUATION WANTED—By foreman polisher, middle aged, with 27 years' experience; have had charge of 2 different shops the last 14 years; understand all lines of work and finishes. Have charge at present. Would like to make a change the first of the year. Can furnish best of references from present and former employers. Address

FIRST OF YEAR
Care of THE METAL INDUSTRY.

PLATER

SITUATION WANTED—Make and analyze solution. Thorough knowledge of Chromium Plating.

KNOWLEDGE,
Care of THE METAL INDUSTRY.

FOREMAN PLATER

SITUATION WANTED—By Foreman Plater, middle aged, capable man with high references covering 30 years' experience. Will take part-time work in New York City.

Box PART TIME,
Care of THE METAL INDUSTRY.

FOREMAN PLATER

SITUATION WANTED—By Foreman Plater. Have position at present but desires to make a change. Can furnish reference.

PRESENT,
Care of THE METAL INDUSTRY.

THE LIST OF ALLOYS

By CAMPBELL

WANTED—Copies of the pamphlet, "A List of Alloys."

THE METAL INDUSTRY
Box 183, Wall Street Station, New York, N. Y.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

ABRASIVES (Also see Emery.)
Alundum
Norton Co., Worcester, Mass.
Artificial
Abrasive Company, Bridesburg, Philadelphia, Pa.
General Abrasive Co., Niagara Falls, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Zucker Sons Co., Inc., Elizabeth, N. J.
Emery
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Keystone Emery Mills, Philadelphia, Pa.
McAleer Mfg. Co., Detroit, Mich.
Pangborn Corp., Hagerstown, Md.
Stevens Co., Inc., Frederic B., Detroit, Mich.

ACCUMULATORS, HYDRAULIC (Also see Hydraulic Machinery.)

ACID PIPE
American Hard Rubber Co., New York, N. Y.
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

ACID PROOF COCKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York, N. Y.

ACID PROOF PIPE
General Ceramics Co., New York, N. Y.
U. S. Stoneware Company, New York.

ACID
Resistance, Hard Rubber
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

ACIDS
Boracic
Harshaw Chemical Co., The, Cleveland, Ohio.
Chromic
Chas. Cooper & Co., New York.
Dennis Co., Martin, New York, N. Y.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
Kuttroff, Pickhardt & Co., New York, N. Y.
Merck & Co., Inc., Rahway, N. J.
Mutual Chemical Co., New York, N. Y.
Prior Co., H. B., New York, N. Y.
Hydrofluoric
General Chemical Co., Philadelphia, Pa.
Harshaw Chemical Co., The, Cleveland, Ohio.
Oil of Vitriol (Sulphuric)
Hegeler Zinc Co., Danville, Ill.
Zapon Co., The, New York, N. Y.
Oxalic
Mutual Chemical Co., New York, N. Y.
Sulphuric
Mutual Chemical Co., New York, N. Y.

AEROPLANE DOPE
Egyptian Laquer Mfg. Co., New York.
Nikolas & Co., G. J., Chicago, Ill.
Zapon Co., The, New York, N. Y.
Mechanical
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

AGITATORS FOR PLATING SOLUTIONS
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Mechanical
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

AIR BRUSHES, COMPRESSORS AND ACCESSORIES (See Sprayers; Spraying Accessories.)
DeVilbiss Mfg. Co., Toledo, O.
Ideal Air Brush Mfg. Co., New York.

AIR FILTERS
DeVilbiss Mfg. Co., Toledo, O.

ALLOYS (See also Kind Wanted.)
Non-Ferrous
American Brass Co., Waterbury, Conn.
Duriron Co., The, Dayton, Ohio.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.
Brass, Bronze, Nickel, Silver
American Brass Co., Waterbury, Conn.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

ALUMINUM (See Ingots, Sheets, Wire, Rod etc.)
Sheet
Strahs Aluminum Co., New York.

ALUMINUM ALLOYS
Alundum
Norton Co., Worcester, Mass.

AMMETERS (See also Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Hanson Van Winkle-Munning Co., Matawan, N. J.

AMYL ACETATE
Egyptian Lacquer Mfg. Co., New York.
Mass & Waldstein Co., Newark, N. J.
Merrimac Chemical Co., New York, N. Y.
Zapon Co., The, New York, N. Y.

ANNEALING FURNACES
Electric
Oil or Gas
Bellevue Industrial Furnace Co., Detroit, Mich.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S. Company, New York.

ANODES
All Metals
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Lustre Co., Inc., St. Louis, Mo.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
Brass and Bronze
Apothecaries Hall Co., Waterbury, Conn.
Daniels & Orben Co., Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
Lasalco, Inc., St. Louis, Mo.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Cadmium
American Cyanamid Co., New York.
Grasselli Chemical Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Udylite Process Co., Kokomo, Ind.
Copper
American Brass Company, Waterbury, Conn.
Apothecaries Hall Co., Waterbury, Conn.
Daniels & Orben Co., Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
Hussey, C. G. & Co., Pittsburgh, Pa.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Lead
Harshaw Chemical Co., The, Cleveland, Ohio.
Nickel
Apothecaries Hall Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
Lasalco, Inc., St. Louis, Mo.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Platinum
Jackson, John J., Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.
Tin
Harshaw Chemical Co., The, Cleveland, Ohio.
Zinc
Apothecaries Hall Co., Waterbury, Conn.
Grasselli Company, The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
Meaker, The, Co., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.

ANTI-FRICTION METAL (See also Babbitt Metal and Bearings.)
Ajax Metal Co., Philadelphia, Pa.

ASSAY CRUCIBLES, Sand
Joseph Dixon Crucible Company, Jersey City, N. J.
Plumbago Crucible Association, The, New York.

ASSAYERS AND CHEMISTS (See also Testing Laboratories.)
Chromium Eng. Corp. of America, New York, N. Y.
Ledoux & Co., New York.
Pitkin, Lucius, Inc., New York.

AUTOMATIC METAL CLEANING MACHINES
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.

AUTOMATIC POLISHING MACHINES
Acme Mfg. Co., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY
Baird Machine Co., Bridgeport, Conn.

BABBITT METAL (See also Bearings.)
Ajax Metal Co., Philadelphia, Pa.

BABBITT MOLDS (See Molds.)

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe, Machine & Stamping Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hartford Steel Ball Co., The., Hartford, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.

BALLS & SPECIAL SHAPES—STEEL
Abbott Ball Co., Hartford, Conn.
Hartford Steel Ball Co., The, Hartford, Conn.

BASKETS DIPPING
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Smith & Co., John P., New Haven, Conn.

BEARINGS (Also see Babbitt metal and Anti-Friction Metal.)
Babbitt
Ajax Metal Co., Philadelphia, Pa.

BLAST FORGES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Miner & Peck Mfg. Co., Derby, Conn.

BLAST GATES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Miner & Peck Mfg. Co., Derby, Conn.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)
Astle, H. J., & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co. Baltimore, Md.
Northern Blower Co., Cleveland, Ohio.

BLOWERS AND EXHAUSTERS
General Ceramics Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWERS, HIGH PRESSURE
Leiman Bros., New York.

BOILER INSULATION (See Brick, Insulating; Insulating Cement.)

BOILERS, SETTING (See Fire Cement.)

BOILERS, WATER TUBE
Babcock & Wilcox Co., New York.

BRASS (See Brass Mill Products; Wire Mill Products; Anodes; Castings; Die Castings; Forgings; Ingots; Rods and Bars; Sheets; Strip Metal; Tubes; Wire.)

BRASS FOUNDERS (See Castings.)

BRASS FOUNDRY EQUIPMENT & SUPPLIES (See Kind Wanted.)
Bellevue Industrial Furnace Co., Detroit, Mich.

BRASS MILL ENGINEERS (See Engineers.)

BRASS MILL MACHINERY (Also see kind Wanted.)

BRASS MILL PRODUCTS
American Brass Co., Waterbury, Conn.
Baltimore Brass Co., Baltimore, Md.
Seymour Mfg. Co., Seymour, Conn.

BRASS ROLLING MILL MACHINERY
Torrington Mfg. Co., Torrington, Conn.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Wire Mill Products; Rods and Bars; Sheets; Strip Metals; Tubes; Wire, Etc.)
American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Dallas Brass & Copper Co., Chicago, Ill.
Hendricks Bros., New York.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Western Cartridge Co., Alton, Ill.
Waterbury Rolling Mills, Waterbury Conn.

BRASS WORKING LATHES (See Lathes.)

BRICK
Cork Paving
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Insulating
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

BRIGHTENERS (For Plating Solutions)
Wambaugh, E., Co., Goshen, Ind.

BRONZE (See Also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.
Western Cartridge Co., Alton, Ill.
Bearing
American Brass Co., Waterbury, Conn.
Phosphor, Tobin, Manganese
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

BRONZING LIQUID
Egyptian Lacquer Mfg. Co., New York.
Merrimac Chemical Co., Boston, Mass.
Nikolas & Co., G. J., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The Co., New York.
Zeller Lacquer Mfg. Co., New York.

BRUSHES
Hand
Blumenthal H. & Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Nikolas & Co., G. J., Chicago, Ill.
Wheel
Blumenthal H. & Co., New York.
Boissier Elec Corp., New York, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING AND POLISHING COMPOSITION
Apothecaries Hall Co., Waterbury, Conn.
Boissier Elec. Corp., New York, N. Y.
Bruce Products Corp., Detroit, Mich.
Buchanan, Thos. Co., Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Oden Corp., College Point, L. I., N. Y.
State Mfg. Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Zucker Sons Co., Inc., Roselle, N. J.

BUFFING AND POLISHING MACHINES
Cleveland Armature Wks., Cleveland, O.
Hisey-Wolf Machine Co., Cincinnati, O.

BUFFING MACHINES
(See Polishing and Buffing Machines.)
Electric
Cleveland Armature Works, Inc., Cleveland, Ohio.
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hisey Wolf Machine Co., Cincinnati, Ohio.

BUFFING MACHINES AUTOMATIC (Also see Polishing Lathes and Heads.)
Columbia Electric Mfg. Co., Cleveland, Ohio.
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Metal Finishers Mach. Co., Cleveland, Ohio.

BUFFING AND POLISHING WHEELS
(Also see Buffs.)
Canvas, Cotton, Etc.
Advance Wheel Mfg. Co., Chicago, Ill.
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Buchanan, Thos. Co., Cincinnati, Ohio.
Codman, F. L. & J. C., Co., So. Boston, Mass.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben, Co., Inc., New York.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
MacFarland Mfg. Co., New York, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Yerges Buff Co., Fremont, Ohio.
Felt
Advance Wheel Mfg. Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Codman, F. L. & J. C., Co., So. Boston, Mass.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Pressed Leather Wheel Co., Little Falls, N. Y.
Yerges Buff Co., Fremont, Ohio.
Leather
Advance Wheel Mfg. Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Muslin
Bruce Products Corp., Detroit, Mich.
Sheepskin
Advance Wheel Mfg. Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Codman, F. L. & J. C., Co., So. Boston, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFS (Also see Buffing and Polishing Wheels.)
Advance Wheel Mfg. Co., Chicago, Ill.
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Buchanan, Thos. Co., Cincinnati, Ohio.
Codman, F. L. & J. C., Co., So. Boston, Mass.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
MacDermid Incorporated, Waterbury, Conn.
MacFarland Mfg. Co., New York, N. Y.
Oden Corp., College Point, L. I., N. Y.
Pressed Leather Wheel Co., Little Falls, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Williamsville Buff Co., Danielson, Conn.
Yerges Buff Co., Fremont, Ohio.

BUILDING PAINT SPRAYERS
DeVilbiss Mfg. Co., Toledo, O.

BURNERS (Also see Furnaces.)
Air and Gas Pre-Mixing
Monarch Engineering & Mfg. Co., Baltimore, Md.
Oil or Gas
Babcock & Wilcox Co., The, New York.
Johnson Gas Appliance Co., Cedar Rapids, Ia.

BURNISHING AND POLISHING BARRELS
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hartford Steel Ball Co., Hartford, Conn.
Henderson Bros. Co., Waterbury, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Smith-Richardson Co., Attleboro, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

BURNISHING COMPOUNDS AND CHIPS (Also see Soap.)
Abbott Ball Co., Hartford, Conn.
Hartford Steel Ball Co., The, Hartford, Conn.
International Chemical Co., Philadelphia, Pa.

CABLING MACHINERY
Torrington Mfg. Co., Torrington, Conn.

CADMIUM OXIDE
Apothecaries Hall Co., Waterbury, Conn.

CADMIUM PLATING
Grasselli Chemical Co., Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York.
Udylite Process Co., Detroit, Mich.

CANVAS WHEELS (See Buffing and Polishing Wheels.)

CASTINGS
Acid Proof
The Duriron Co., Dayton, Ohio.
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Brass, Bronze and Composition
Ajax Metal Co., Philadelphia, Pa.

CAUSTIC SODA
Buchanan, The Thos. Co., Cincinnati, Ohio.
International Chemical Co., Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

CEMENT (See Fire Cement; Insulating Cement.)

CENTRIFUGAL DRYERS AND EXTRACTORS (Also see Drying-Out Machines.)
Tolhurst Machine Works, Troy, N. Y.

CENTRIFUGAL PUMPS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York, N. Y.

CHAIN GRATE STOKERS
Babcock & Wilcox Co., New York.

CHEMICALS, DEALERS IN ALL KINDS (Also see Kind Wanted.)
Platers
Chas Cooper & Co., New York.
Grasselli Chemical Co., Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
The Lustre Co., Inc., St. Louis, Mo.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Platers and Galvanizers Equipment
U. S. Galvanizing & Pltg Equip. Corp., Brooklyn, N. Y.

CHEMISTS, CHROMIUM
Chromium Eng. Corp. of America, New York.
Weisberg & Greenwald, New York, N. Y.

CHEMISTS, CONSULTING (See Assayers and Chemists; Testing Laboratories.)
Chromium Eng. Corp. of America, New York.
Weisberg & Greenwald, New York, N. Y.

CHLORIDE
Nickel
Harshaw Chemical Co., The, Cleveland, Ohio.

CHLORIDE TESTERS
State Mfg. Co., Chicago, Ill.
Wood Co., Walter S., Boston, Mass.

CHROMIC ACID
Chromium Eng. Corp. of America, New York.
Cooper & Co., Chas., New York.
Dennis Co., Martin, New York, N. Y.
Grasselli Chemical Co., Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
Kuttroff, Pickhardt, New York, N. Y.
Merck & Co., Inc., Rahway, N. J.
Mutual Chemical Co., New York, N. Y.
Prior Co., H. B., New York, N. Y.
U. S. Electro Chemical Corp., New York.

CHROMIUM PLATING
Atlas Plating Works, Inc., Cleveland, Ohio.
Chromium Corp. of America, New York.
General Chromium Corp., Detroit, Mich.
Chromeplate, Inc., New York, N. Y.
Chromium Eng. Corp. of America, New York, N. Y.
International Chromium Plating Corp., Providence—New York.
Metal & Thermit Corp., New York.
National Chromium Corp., New York.
Tillmann Electro Plating Wks., Inc., New York.
United Chromium Corp., New York, N. Y.
Weisberg & Greenwald, New York.

CHROMIUM PLATING MACHINERY
Connecticut Dynamo & Motor Co., Irvington, N. J.
Chromium Corp. of America, New York.
Chromium Machine Co., Inc., Sag Harbor, L. I.
Chromium Eng. Corp. of America, New York, N. Y.
General Chromium Corp., Detroit, Mich.
New Haven Sherardizing Co., The, Hartford, Conn.
Tillmann Electro Plating Wks., Inc., New York.
United Chromium, Inc., New York.
Weisberg & Greenwald, New York.
Controllers
Foxboro Co., The, Foxboro, Mass.

CHROMIUM PLATING FUME EXHAUST SYSTEMS
Chromium Eng. Corp. of America, New York.
Northern Blower Co., Cleveland, O.

CHROMIUM PLATING POLISH
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Groveland, Mass.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.
Zucker Sons Co., Inc., Roselle, N. J.

CHUCKING MACHINES, AUTOMATIC
Baird Machine Co., Bridgeport, Conn.

CHUCKS
Oval
Pryibil, P., Machine Co., New York.
Spinning
Pryibil, P., Machine Co., New York.

CLEANERS, METAL
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Cleveland, Ohio.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Philadelphia, Pa.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
MacDermid Incorporated, Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.
Sulphur Products Co., Greensburg, Pa.

CLEANING APPARATUS, AUTOMATIC METAL (Also see Pickling Machines.)
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Ransohoff N., & Co., Cincinnati, Ohio.

CLEANING COMPOUNDS (See also Fig Cleaner; Pickling Compounds, Whale Oil Soaps.)
Metal
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Cleveland, Ohio.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Philadelphia, Pa.
Lasalco, Inc., St. Louis, Mo.
The Lustre Co., Inc., St. Louis, Mo.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. Y.
Oakite Products, Inc., New York, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Sulphur Products Co., Greensburg, Pa.

CLEANING SOLVENTS
Waukegan Chemical Co., Waukegan, Ill.

CLEANING SYSTEMS
(Vacuum)
Allington & Curtis Co., Saginaw, Mich.

COCK GRINDERS
Automatic
Turner Foundry & Machine Co., Philadelphia, Pa.

COCKS
Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.

COLLECTING SYSTEMS (Dust, Shavings, Sawdust, Dust Metal.)
Allington & Curtis Co., Saginaw, Mich.

COMMUTATORS
Belke Mfg. Co., Chicago, Ill.
Cleveland Armature Works, Inc., Cleveland, Ohio.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

COMPOSITION METAL (See Castings; Ingot, Etc.)

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

Greaseless, for Metal Finishing
Lea Mfg. Co., The, Waterbury, Conn.

COMPOSITIONS (See Buffing and Polishing Composition; Flooring Composition.)
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Lustre Co., Inc., St. Louis, Mo.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

COMPOUNDS, CUTTING AND GRINDING DRAWINGS, STAMPING
International Chemical Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

COMPRESSORS, AIR & GAS (See Air Compressors.)

CONCENTRATING TABLES (See Reclaiming Machinery.)

CONTRACT PLATING (All Kinds.)
Chromium Eng. Corp. of America, New York.
M-C Plating Co., Newark, N. J.
Modern Electro Plating Co., Providence.
Nelkin Plating Works, New York, N. Y.
Sievering, Philip, Inc., New York, N. Y.
Tillmann Electro Plating Wks., Inc., New York, N. Y.

CONTROLLERS
Foxboro Co., The, Foxboro, Mass.

CONVEYING SYSTEMS (Pneumatic Light Materials.)
Allington & Curtis Co., Saginaw, Mich.
Belke Mfg. Co., Chicago, Ill.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COPPER (Also see Anodes; Castings; Ingots, Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)
Sheet, Wire, Rod, Tube
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

COPPER BEARING MATERIAL, BUYERS OF (See Drosses, Residues, Etc.)

COPPER BORONIC
American Boron Products Co., Buffalo, N. Y.

COPPER, CARBONATE OF
Cooper, Chas., & Co., New York, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., Inc., New York.
L'Hommedieu & Sons, Chas. F., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York, N. Y.

COPPER-CYANIDE
American Cyanamid Co., New York.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Zapon Co., The, New York, N. Y.

CORE MACHINES
Stevens, Inc., Frederic B., Detroit, Mich.

CORE OIL AND COMPOUNDS
Stevens, Inc., Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick Insulating; Insulating Cement; Insulating Oven.)

CORE OVENS
Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore.
H. E. Steiner & Co., Newark, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Oil and Gas
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.

COTTON BUFFS
Williamsville Buff Co., Danielson, Conn.

COUPLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CRUCIBLES, METAL MELTING
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., of Pittsburgh, Pittsburgh, Pa.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Plumbago Crucible Association, The, New York.
Ross Tacony Crucible Co., Tacony, Philadelphia, Pa.
Stevens, Inc., Frederic B., Detroit, Mich.

CRUSHERS AND PULVERIZERS (See also Reclaiming Machinery.)
Eastern Machinery Co., New Haven, Conn.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Standard Equipment Co., New Haven, Conn.

CUPRO-NICKEL (See Brass Mill Products.)

CUTTING, STRAIGHTENING & FORMING MACHINERY
Wire
Baird Machine Co., Bridgeport, Conn.
Schuster, F. B., Co., New Haven, Conn.
Strip Metal
American Cyanamid Co., New York.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Schuster, F. B., Co., New Haven, Conn.

CYANIDES
American Cyanamid Co., New York.

CYANIDE SORE HEALER
Wambaugh, E., Co., Goshen, Ind.

DEOXIDIZERS, METAL (See Fluxes.)

DIE CASTINGS
Aluminum
Aluminum Company of America, Pittsburgh, Pa.

DIPPING BASKETS
Dipping and Plating
American Hard Rubber Co., New York.
Dellinger Co., A. M., Lancaster, Pa.
General Ceramics Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Smith, John P., Co., New Haven, Conn.
U. S. Stoneware Co., New York.
Stoneware
General Ceramics Co., New York.

DRAW BENCHES
Wire, Rod, Tube
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Watson-Stillman Co., New York.

DRAWING COMPOUNDS AND OILS
Bruce Products Corp., Detroit, Mich.

DRAWING AND STAMPING (See Metal Goods Made to Order; Stamping and Drawing.)

DRILLS
Electric Portable
Electric Radial
Electric Bench
Hisey Wolf Machine Co., Cincinnati, Ohio.

DRINKING WATER SUPPLY SYSTEMS
Armstrong Cork & Insulation Co., Lancaster, Pa.

DROP LIFTERS (See also Presses, Drop Lifters for.)
Automatic
Miner & Peck Mfg. Co., Derby, Conn.

DROSSES, RESIDUES, ETC., BUYERS OF (Also see Metal Dealers, Old.)

DRYERS (See Centrifugal Dryers; Ovens: Drying-Out Machines; Ladle Heaters and Dryers; Mold Dryers; and Dryers: Sawdust Drying-Out Boxes.)

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.
Automatic
Astle, H. J., & Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.

DUST ARRESTORS
Cloth Screen
Northern Blower Co., Cleveland, O.

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Northern Blower Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bogue, Chas. J., Electric Co., New York.
Boissier Elec. Corp., New York, N. Y.
Chandeysson Electric Co., St. Louis, Mo.
Columbia Electric Mfg. Co., Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Jantz & Leist Electric Co., Cincinnati, Ohio.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

DYNAMOS, PLATING, USED
Fuerst-Friedman Co., Cleveland, Ohio.
J. Holland Sons, Brooklyn, N. Y.
Roe, Lewis, Brooklyn, N. Y.

ECONOMIZERS
Babcock & Wilcox Co., New York.

ELECTRIC CRANES (See Cranes.)

ELECTRIC FURNACES
Melting
Ajax Metal Co., Philadelphia, Pa.

ELECTRIC OVENS (See Ovens; also Core Ovens.)

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bogue, Chas. J., Electric Co., New York.

ELECTRICAL CONDUCTORS
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, Etc.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker, The, Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO-GALVANIZING JOB AND CONTRACT
Hassall, John, Inc., Brooklyn, N. Y.
Meaker, The, Co., Chicago, Ill.
Mercil Plating Equipment Co., Chicago, Ill.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Boissier Elec. Corp., New York, N. Y.
Cleveland Armature Works, Inc., Cleveland, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Lustre Co., Inc., The, St. Louis, Mo.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Mercil Plating Equipment Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Controllers
Foxboro Co., The, Foxboro, Mass.

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)
Chromium Eng. Corp. of America, New York.
Meaker, The, Co., Chicago, Ill.
Mercil Plating Equipment Co., Chicago, Ill.
New Haven Sherardizing Co., The, Hartford, Conn.
Tillmann Electro Plating Wks., Inc., New York, N. Y.

ELECTRO PLATING & GALVANIZING BARRELS
Boissier Elec. Corp., New York, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

ELECTRO PLATING TANKS
General Ceramics Co., New York, N. Y.

ELECTROTYPING EQUIPMENT & SUPPLIES
Boissier Elec. Corp., New York, N. Y.

EMERY (Also see Abrasives.)
Allied Industrial Products Co., Chicago, Ill.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Keystone Emery Mills, Philadelphia, Pa.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
McAleer Mfg. Co., Detroit, Mich.
Stevens, Inc., Frederic B., Detroit, Mich.

EMERY PASTE
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

ENAMELING OVENS (See Ovens.)

ENAMELS
Colored
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Co., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.
Lacquer
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Co., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
Merrimac Chemical Co., Boston, Mass.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.
Wood
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Co., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

ENAMEL SPRAYERS (See Sprayers.)

ENGINEERS
Chromium
Chromium Eng. Corp. of America, New York.
Weisberg & Greenwald, New York, N. Y.
Chromium Plating
Chromium Eng. Corp. of America, New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Weisberg & Greenwald, New York, N. Y.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

Foundry
Bellevue Industrial Furnace Co., Detroit, Mich.

Furnace
Monarch Engineering & Mfg. Co., Baltimore, Md.

Metal Finishers
Weisberg & Greenwald, New York, N. Y.

Plating
Connecticut Dynamo & Motor Co., Irvington, N. J.

ENGINEERS, POLISHING AND GRINDING
Divine Bros., Utica, N. Y.

EQUIPMENT

Chromium Plating
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Weisberg & Greenwald, New York.

Electro Plating
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Mercil Plating Equipment Co., Chicago, Ill.

ESCUTCHEON PINS, ALL METAL
Hassall, John, Inc., Brooklyn, N. Y.

ETHYL ACETATE
Merrimac Chemical Co., Boston, Mass.
Zapon Co., The, New York, N. Y.

EXHAUST FANS AND HEADS (Also see Blowers and Blow Piping; Dust Collectors and Ventilating Systems.)
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.

EXHAUST SYSTEMS
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Northern Blower Co., Cleveland, O.

EXTRUDED SHAPES

Brass, Copper and Bronze

FACINGS (See Foundry Facings.)

FANS (Exhaust)
Allington & Curtis Co., Saginaw, Mich.

FEEDERS (Furnace, Wood Waste.)
Allington & Curtis Co., Saginaw, Mich.

FELT
Allied Industrial Products Co., Chicago, Ill.

FELT, POLISHING
American Felt Co., Boston, Mass.
Eastern Felt Co., Winchester, Mass.

FELT POLISHING WHEELS
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Codman, F. L., & J. C., Co., So. Boston, Mass.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
L'Hommedieu & Sons, Chas. F., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.

FELT SHEETS
Eastern Felt Co., Winchester, Mass.
L'Hommedieu & Sons, Chas. F., Chicago, Ill.

FELT WHEELS
American Felt Co., Boston, Mass.
Eastern Felt Co., Winchester, Mass.

FERRULES, BRASS AND COPPER
American Brass Co., Waterbury, Conn.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.

FILTER AERATING & AGITATING SYSTEM
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

FILTER SYSTEM FOR PLATING SOLUTIONS
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

FILTER, TANK
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

FIRE BRICK
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

FIRE CEMENT
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., of Pittsburgh, Pittsburgh, Pa.

FLOORING COMPOSITION
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Dyer, Inc., New York.

Acid Proof
Dyer, Inc., New York

FLUXES

Soldering and Tinning
Bruce Products Corp., Detroit, Mich.
Johnson Mfg. Co., Chicago, Ill.

FORGES, BLAST
Miner & Peck Mfg. Co., Derby, Conn.

FOUNDRY EQUIPMENT AND SUPPLIES (See Kind Wanted.)

FOUNDRY FACINGS
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Plumbago Crucible Association, The, New York.
Stevens, Inc., Frederic B., Detroit, Mich.

FOUNDRY RIDDLES (See Sand Sifters.)

FOUNDRY SPRAYERS (See Sprayers.)

Frictions
Divine Bros. Co., Utica, N. Y.

FURNACE CEMENT (See also Fire Cement.)

FURNACE ENGINEERS (See Engineers.)
Bellevue Industrial Furnace Co., Detroit, Mich.

FURNACE INSULATION (See Brick Insulating; Insulating Cement; Insulation, Furnace.)

FURNACES (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)
Ajax Metal Co., Philadelphia, Pa.
Fischer, Alfred, Furnace Co., Chicago, Ill.
Monarch Engineering & Mfg. Co., Baltimore, Md.

FURNACE TILE AND LININGS (Also see Fire Brick.)
Bellevue Industrial Furnace Co., Detroit, Mich.
Monarch Engineering & Mfg. Co., Baltimore, Md.

FUSE METAL
Platt Bros. & Co., Waterbury, Conn.

GALVANIZING (See also Electro Galvanizing Job, and Contract; Hot Galvanizing, Job and Contract.)
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

GALVANIZING AND TINNING FURNACES (Also see Burners.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

GALVANIZING EQUIPMENT AND SUPPLIES (See Kinds Wanted. Also Plating Galvanizing Machines. Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

GAS APPLIANCES
Johnson Gas Appliance Co., Cedar Rapids, Ia.

GAS BURNERS (See Burners.)

GATE CUTTERS (See Saws; Sprue Cutters.)

GENERATORS (See Dynamos; Motor-Generator Sets.)
Chandeysson Electric Co., St. Louis, Mo.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Lustre Co., Inc., The, St. Louis, Mo.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

GLUE FOR POLISHING
Daniels & Orben Co., New York.
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GLUE HEATERS AND POTS
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GOLD (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

GRAPHITE PRODUCTS, PHOSPHORIZERS, STIRRERS, ETC. (Also see Crucibles.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Plumbago Crucible Association, The, New York.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.

GREASELESS COMPOSITIONS
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lea Mfg. Co., The, Waterbury, Conn.

GRINDERS

Die Electric
Hisey-Wolf Machine Co., Cincinnati, Ohio.

Disc Electric
Hisey-Wolf Machine Co., Cincinnati, Ohio.

Electric Internal
Hisey-Wolf Machine Co., Cincinnati, Ohio.

Lathe (Internal and External)
Hisey-Wolf Machine Co., Cincinnati, Ohio.

Electric Portable
Hisey-Wolf Machine Co., Cincinnati, Ohio.

Tool Post Electric
Hisey-Wolf Machine Co., Cincinnati, Ohio.

GRINDERS & BUFFERS

Electric
Cleveland Armature Works, Inc., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hisey-Wolf Machine Co., Cincinnati, Ohio.

GRINDING MACHINES
Cleveland Armature Works, Inc., Cleveland, Ohio.
Divine Bros. Co., Utica, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.

Portable
Hisey-Wolf Machine Co., Cincinnati, Ohio.

GRINDING WHEEL HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

GRINDING WHEELS
Abrasive Co., Philadelphia, Pa.

HARD RUBBER FITTINGS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

Pipe
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

Hard Rubber Tanks
American Hard Rubber Co., New York.

HOODS (Also see Dust Collectors and Ventilating Systems.)

Polishing and Grinding Wheel
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Spraying
De Vilbiss Mfg. Co., Toledo, Ohio.

HOT GALVANIZING AND TINNING EQUIPMENT (See Burners; Galvanizing and Tinning Furnaces; Kettles; Tanks.)

HOT TINNING EQUIPMENT (See Hot Galvanizing and Tinning Equipment.)

HYDRAULIC MACHINERY, PRESSES, JACKS, ETC. (Also see Accumulators, Presses.)
Farrel-Birmingham Co., Inc., Ansonia, Conn.

INGOTS (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)

Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., New York and Toronto, Ontario.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Brass, Bronze and Composition
Ajax Metal Company, Philadelphia, Pa.
Belmont Smelting & Refining Works, Brooklyn, N. Y.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Copper
Hendricks Bros., New York.

Lead
United Metals Selling Co., New York.

Tin
Ajax Metal, Philadelphia, Pa.

INSULATING BRICK, BLOCK, POWDER AND CEMENT (See also Brick.)
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

INSULATING CEMENT, HEAT
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.

INSULATION (Also see Brick, Insulating, Insulating Cement.)

Boiler
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Oven
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Furnace
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Pipe
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
American Hard Rubber Co., New York, N. Y.

IRON CASTINGS (See Castings.)

JAPAN REMOVERS
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

JAPANS, ALL KINDS
Zapon Co., The, New York, N. Y.

JAPANNING BARRELS (See Tumbling Barrels.)

JAPANNING OVENS (See Ovens.)

JEWELERS' EQUIPMENT (Also see Kind Wanted.)
Leiman Bros., New York.
Smith-Richardson Co., Attleboro, Mass.

JEWELERS' ROLLS (See Rolls.)

JEWELERS' SOLDER (See Solders.)

JIGS, FIXTURES, ETC. (See Tools, Jigs, Fixtures.)

LABORATORY WARE

LABORATORIES
(See Testing Laboratories.)

LACQUERING BARRELS (See Tumbling Barrels.)

LACQUER ENAMELS (See Enamels.)
Lacquer & Chemical Corp., Brooklyn, N. Y.
Nikolas & Co., G. J., Inc., Chicago, Ill.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

LACQUERS

Colored
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Corp., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
Merrimac Chemical Co., Boston, Mass.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

For Incandescent Lamps
Egyptian Lacquer Mfg. Co., New York.
Zapon, The, Co., Stamford, Conn.

Metal
Apothecaries Hall Co., Waterbury, Conn.
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Corp., Brooklyn, N. Y.
Maas & Waldstein Co., Newark, N. J.
Merrimac Chemical Co., Boston, Mass.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

Wood
Egyptian Lacquer Mfg. Co., New York.
Lacquer & Chemical Corp., Brooklyn, N. Y.
Merrimac Chemical Co., Boston, Mass.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

LACQUER REMOVERS
Egyptian Lacquer Mfg. Co., New York.
International Chemical Co., Philadelphia, Pa.
Lacquer & Chemical Corp., Brooklyn, N. Y.
Magnus Chemical Co., Garwood, N. J.
Nikolas & Co., G. J., Inc., Chicago, Ill.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Zapon, The, Co., Stamford, Conn.

LACQUER SPRAYERS (See Sprayers.)
Economy Machine Products Co., Chicago, Ill.

LACQUERING
Mercil Plating Equipment Co., Chicago, Ill.

LADLE HEATERS AND DRYERS
Monarch Engineering & Mfg. Co., Baltimore, Md.

LATHES (See also Polishing Lathes.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.

Electric
Gardner Machine Co., Beloit, Wis.
Hill-Curtis Co., Kalamazoo, Mich.
U. S. Electrical Tool Co., Cincinnati, Ohio.

Polishing
Gardner Machine Co., Beloit, Wis.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hill-Curtis Co., Kalamazoo, Mich.
U. S. Electrical Tool Co., Cincinnati, Ohio.

Spinning
Pryibil Machine Co., New York, N. Y.

LEAD BURNING
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.

LEAD-LINED TANKS (See Tanks.)

LEATHER POLISHING WHEELS (See Buffing and Polishing Wheels.)

LOCOMOTIVES, INDUSTRIAL (See Electric Locomotives.)

LUBRICANTS, Cutting and Grinding, Drawing, Stamping
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

MACHINERY

Cleaning Metal (Mech.)
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Dry Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Metal Drying
Ransohoff, N., Co., Inc., Cincinnati, Ohio.

Metal Working
Pryibil Machine Co., New York, N. Y.

Pickling Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Galvanizing (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Plating (Mech.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MAGNETIC SEPARATORS (See also reclaiming Machinery.)

MANGANESE
Metal & Thermit Corp., New York.

MANGANESE-COPPER (Also see Ingots.)
Ajax Metal Co., Philadelphia, Pa.
Metal & Thermit Corp., New York.

MANTLE DIP
Zapon Co., The, Stamford, Conn.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)
Bellevue Industrial Furnace Co., Detroit, Mich.

Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.

Oil or Gas
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Pit
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.

Reverberatory
Monarch Engineering & Mfg. Co., Baltimore, Md.

METAL BRIQUETTES (See Briquet-Ingots.)

METAL CLEANERS (See also Cleaning Compounds.)
Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Cleveland, Ohio.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.
Sulphur Products Co., Greensburg, Pa.

METAL DEALERS (Also see Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of.)

Gold, Silver, Platinum
Radnai, Josef, New York.
Roessler & Hasslacher Chemical Co., New York.

Old Metals
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.

Rare Metals
Radnai, Josef, New York.

METAL DRYERS, CENTRIFUGAL
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Tolhurst Machine Works, Troy, N. Y.

METAL GOODS MADE TO ORDER (Also see Stamping and Drawing.)
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

METAL POLISH
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

METAL RECLAIMING EQUIPMENT (See Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)

METAL SPECIALTIES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

METALS (See also Kinds Wanted. Also Metal Dealers.)

Acid Resistant
The Duriron Co., Dayton, Ohio.

Bearing
American Brass Co., Waterbury, Conn.

Extruded and Die Pressed
American Brass Co., Waterbury, Conn.

METALS, PLATED SHEET (See Plated and Polished Sheet Metals; Sheets.)

METALS, RARE (See Metal Dealers.)

MILLS CRUSHING (See also Crushers and Pulverizers.)

MOLD DRYERS, PORTABLE
Monarch Engineering & Mfg. Co., Baltimore, Md.

MOLDING MACHINES

Power
Turner Foundry & Machine Co., Philadelphia, Pa.

MOLDING SAND (See Sand.)

MOLDINGS & EXTRUDED SHAPES

Aluminum
Aluminum Company of America, Pittsburgh, Pa.

MOLDS (See also Mold Makers.)

Babbitt and Solder
Fanning, J. P., Co., Brooklyn, N. Y.
Schweizer, Chas. K., St. Louis, Mo.

Ingot
Fanning, J. P., Co., Brooklyn, N. Y.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Schweizer, Chas. K., St. Louis, Mo.

MOLD SPRAYERS (See Sprayers.)

MOTOR CONTROL EQUIPMENT (See also Electrical Apparatus and Equipment.)

MOTORS (Also see Electrical Apparatus and Equipment.)
Cleveland Armature Works, Inc., Cleveland, Ohio.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.

Electric
Chandeysson Electric Co., St. Louis, Mo.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Boissier Electric Co., New York.
Chandeysson Electric Co., St. Louis, Mo.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Jants & Leist Electric Co., Cincinnati, Ohio.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.

Plating and Galvanizing
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MUFFLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

MUNTZ METAL (See Sheets.)

NICKEL (See Anodes; Castings; Sheets; Wire, Etc.)

NICKEL CARBONATE, MOIST AND DRY
Harshaw Chemical Co., The, Cleveland, Ohio.

NICKEL CHLORIDE
Harshaw Chemical Co., The, Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York, N. Y.

NICKEL PLATING
Chromium Eng. Corp. of America, New York.
Sievering, Philip, Inc., New York, N. Y.

NICKEL SALTS
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, Thos., Co., Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid, Inc., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederic B., Detroit, Mich.

NICKEL SHOT
Seymour Mfg. Co., Seymour, Conn.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube Castings; Forgings, Sheets; etc.)
Western Cartridge Co., Alton, Ill.

Sheets, Wire, Rod, Tube
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

NICKEL SULPHATE, SINGLE AND DOUBLE
Harshaw Chemical Co., The, Cleveland, Ohio.

NICKEL CHLORIDE TESTERS
State Mfg. Co., Chicago, Ill.
Wood, Walter S., Boston, Mass.

OIL BURNERS (See Burners.)

OIL PUMPS (See also Oil Storage Systems.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

OLD METALS (See Drosses, Residues, Etc., Buyers of; Metal Dealers.)

OVENS (Also see Burners; also Core Ovens.)
Enameling, Lacquering, Japanning
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Northern Blower Co., Cleveland, O.
Steiner & Co., E. E., Newark, N. J.

OVEN BURNERS (See Burners.)

OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation.)

OXIDIZING SOLUTIONS
Sulphur Products Co., Greensburg, Pa.

PANELS
Bakelite
Mercil Plating Equipment Co., Chicago, Ill.

PAINT SPRAYERS (See Sprayers.)

PATTERN SHOP EQUIPMENT (See Lathes; Saws.)

PAVING BRICK, CORK (See Brick.)

PHOSPHOR BRONZE (See also Ingots.)
Ajax Metal Co., Philadelphia, Pa.
Western Cartridge Co., Alton, Ill.

PHOSPHORIZERS (See Graphite Products.)

PHOSPHOR-COPPER (Also see Ingots.)
Ajax Metal Co., Philadelphia, Pa.

PHOSPHOR-COPPER, BORONIC
American Boron Products Co., Buffalo, N. Y.

PHOSPHOR-TIN (See also Ingots.)
Ajax Metal Co., Philadelphia, Pa.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING TANKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York, N. Y.

PIPE ALUMINUM
Aluminum Company of America, Pittsburgh, Pa.

PIPE, BRASS AND COPPER
American Brass Co., Waterbury, Conn.

PIPE AND BOILER COVERINGS, STEAM, ICE WATER, BRINE (See also Insulation.)
Armstrong Cork & Insulation Co., Lancaster, Pa.

PIPE AND FITTINGS
Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.
Acid Proof. Hard Rubber.
American Hard Rubber Co., New York.

PISTON, RODS, TOBIN BRONZE
American Brass Co., Waterbury, Conn.

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.

PLATERS' BRUSHES (See Brushes.)

PLATERS' BUCKETS, DIPPERS & PITCHERS
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

PLATERS' COMPOUND (See Whale Oil Soap.)

PLATERS' SUPPLIES
Columbia Electric Mfg. Co., Cleveland, O.

PLATING
American Hard Rubber Co., New York, N. Y.
General Chromium Corp., Detroit, Mich.
Modern Electro Plating Co., Providence, R. I.
New Haven Sherardizing Co., Hartford, Conn.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Cadmium
Modern Electro Plating Co., Providence, R. I.
New Haven Sherardizing Co., Hartford, Conn.
Contract
M-C Plating Co., Newark, N. J.
Magosy Buscher Co., New York, N. Y.
Modern Electro Plating Co., Providence, R. I.
Slevering, Philip, Inc., New York, N. Y.
Chromium—Job and Contract
Chromeplate, Inc., New York, N. Y.
Chromium Corp. of America, New York.
Chromium Eng. Corp. of America, New York.
General Chromium Corp., Detroit, Mich.
Modern Electro Plating Co., Providence, R. I.
National Chromium Corp., New York, N. Y.
New Haven Sherardizing Co., Hartford, Conn.
Tri Pact Chromium Ptg. Co., New York, N. Y.
United Chromium Corp., New York, N. Y.
Udylite Process Co., Detroit, Mich.
Silver
H. D. Robbins, New York, N. Y.

PLATING BARRELS, ROTARY
Belke Mfg. Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Lasalco, Inc., St. Louis, Mo.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.

PLATING AND GALVANIZING BARRELS
Belke Mfg. Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Daniels & Orben Co., Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING BARREL METHOD, JOB AND CONTRACT (See Electrotyping.)
Mercil Plating Equipment Co., Chicago, Ill.

PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Daniels & Orben Co., Inc., New York, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lustre Co., Inc., The, St. Louis, Mo.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING GENERATORS
Chandeysson Electric Co., St. Louis, Mo.
Columbia Electric Mfg. Co., Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Holland, J., & Sons, Brooklyn, N. Y.
Lasalco, Inc., St. Louis, Mo.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING MATERIALS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., Cleveland, Ohio.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.

PLATING RACKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTION AGITATOR
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

PLATINUM (See Smelters and Refiners; Anodes; Bars; Metal Dealers; Sheets; Etc.)

PLATINUM BUFFING CAKE (See Buffing and Polishing Compositions.)

POLISHERS, FLOOR AND BENCH
Astle, H. J., & Co., Providence, R. I.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hill-Curtis Co., Kalamazoo, Mich.
Gardner Machine Co., Beloit, Wis.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING ABRASIVES
Abrasive Company, Bridesburg, Philadelphia, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Keystone Emery Mills, Philadelphia, Pa.
McAleer Mfg. Co., Detroit, Mich.
Norton Co., Worcester, Mass.
Zucker Sons Co., Inc., Roselle, N. J.

POLISHING COMPOSITIONS (See Buffing and Polishing Compositions.)
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Groveland, Mass.
Lea Mfg. Co., The, Waterbury, Conn.
Lustre Co., Inc., St. Louis, Mo.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
McAleer Mfg. Co., Detroit, Mich.
Stevens, Inc., Frederic B., Detroit, Mich.
Zucker Sons Co., Inc., Roselle, N. J.

POLISHING DUST COLLECTING OUTFITS
Small
Astle & Co., Inc., H. J. Providence, R. I.
Leiman Bros., New York.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)
Gardner Machine Co., Beloit, Wis.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hill-Curtis Co., Kalamazoo, Mich.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING FELTS
Eastern Felt Co., Winchester, Mass.

POLISHING HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

POLISHING LATHES AND HEADS
Electric
Cleveland Armature Works, Inc., Cleveland, Ohio.
Columbia Electric Mfg. Co., Cleveland, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Gardner Machine Co., Beloit, Wis.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hill-Curtis Co., Kalamazoo, Mich.
Hisey Wolf Machine Co., Cincinnati, Ohio.
L'Hommedieu & Sons, Chas. F., Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
U. S. Electrical Tool Co., Cincinnati, Ohio.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)
Automatic
Acme Mfg. Co., Detroit, Mich.
Gardner Machine Co., Beloit, Wis.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING MATERIALS
Keystone Emery Mills, Philadelphia, Pa
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Zucker Sons Co., Inc., Roselle, N. J.

POLISHING MOTORS, ELECTRIC (See Polishing Lathes.)

POLISHING AND BURNISHING; JOB AND CONTRACT (See also Electro Plating.)

POLISHING AND GRINDING ENGINEERS (See Engineers.)
Divine Bros. Co., Utica, N. Y.

POLISHING GRAIN
Norton Company, Worcester, Mass.

POLISHING WHEELS (See Buffing and Polishing Wheels.)
Advance Wheel Mfg. Co., Chicago, Ill.
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Yerges Buff Co., Toledo, Ohio.

POTASH
First Sorts
International Chemical Co., Philadelphia, Pa.
Real
International Chemical Co., Philadelphia, Pa.

POTASSIUM CYANIDE
Roessler & Hasslacher Chemical Co., New York.

POWDERED COAL BURNERS (See Burners.)

POWDERED METALS
Aluminum
Aluminum Company of America, Pittsburgh, Pa.

PRESSES (Also see Scrap Baling Machine.)
Bench and Foot
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Cabbaging
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Power, All Types
Baird Machine Co., Bridgeport, Conn.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Miner & Peck Mfg. Co., Derby, Conn.

PRESSES, DROP LIFTERS FOR
Miner & Peck Mfg. Co., Derby, Conn.

PRESSURE BLOWERS (See Blowers and Blow-Piping.)

PULVERIZERS
Standard Equipment Co., New Haven, Conn.

PUMICE STONE
Allied Industrial Products Co., Chicago, Ill.

PUMPS
Centrifugal. Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.
Hard Rubber. Acid Proof
American Hard Rubber Co., New York.
Reciprocating. Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.

PYROMETERS
Taylor Instrument Companies, Rochester, N. Y.

RACKS—Rubber Covering for
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Plating
Belke Mfg. Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

RECLAIMING MACHINERY; METAL (Also see Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)
Eastern Machinery Co., New Haven, Conn.
Standard Equipment Co., New Haven, Conn.

RECORDING THERMOMETERS (See Thermometers.)
Taylor Instrument Companies, Rochester, N. Y.

REFINERS AND SMELTERS (See Smelters and Refiners.)
North American Smtg. & Refg. Co., Phila., Pa.

RESPIRATORS
Chicago Eye Shield Co., Chicago, Ill.

RETORTS, GRAPHITE
Dixon, Joseph, Crucible Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Plumbago Crucible Association, The, New York.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Belke Mfg. Co., Chicago, Ill.
Columbia Electric Mfg. Co., Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
L'Hommedieu & Co., Chas. F., Chicago, Ill.

RIDDLES (See Foundry Riddles.)

RIVET MAKING MACHINERY

RODS AND BARS (Also see Brass Mill Products.)

Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., New York-Toronto, Canada.

Brass, Bronze and Copper
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

ROLLING MILL MACHINERY (See also Draw Benches; Hydraulic Machinery; Presses; Rolls; Shears; Slitters.)
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Yoder, The, Co., Cleveland, Ohio.

ROLLS

Chilled and Sand Iron
Farrel-Birmingham Co., Inc., Ansonia, Conn.

Jewelers
Leiman Bros., New York.

ROUGE (See Buffing and Polishing Compositions.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McAleer Mfg. Co., Detroit, Mich.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Zucker Sons Co., Inc., Roselle, N. J.

RUBBER TANKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.

RUST PREVENTATIVES
International Chemical Co., Philadelphia, Pa.
New Haven Sherardizing Co., Hartford, Conn.
Oakite Products, Inc., New York, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

RUST PROOF PROCESS
New Haven Sherardizing Co., Hartford, Conn.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Udylite Process, Inc., Detroit, Mich.

RUST REMOVERS
International Chemical Co., Philadelphia, Pa.

SAND

For Sand Blasting
Standard Equipment Co., New Haven, Conn.

SAND BLASTS

Accessories
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

Barrel
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

Cabinet
Astle, H. J., & Co., Providence, R. I.
Standard Equipment Co., New Haven, Conn.

Sand Blast Systems
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

SAND BLASTS AND EQUIPMENT
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

SAND SIFTERS
Turner Foundry & Machine Co., Philadelphia, Pa.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Smith-Richardson Co., Attleboro, Mass.

SAWDUSTLESS METAL DRYERS
Tolhurst Machine Co., Troy, N. Y.

SCRAP METAL DEALERS (See Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of; Metal Dealers.)

SCREW DRIVERS ELECTRIC
Hisey-Wolf Co., Cincinnati, Ohio.

SCREW MACHINE PRODUCTS (Also see Machine Products.)
Economy Machine Products Co., Chicago, Ill.

SEPARATORS, MAGNETIC (See Magnetic Separators.)

SHEARS (See Slitters.)

SHEEPSKIN POLISHING WHEELS
Allied Industrial Products Co., Chicago, Ill.
Codman, F. L., & J. C., Co., So. Boston, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

SHEET FELT
American Felt Co., Boston, Mass.
Eastern Felt Co., Winchester, Mass.

SHEET METAL PIPING FOR ALL PURPOSES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEET METAL SPECIALTIES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEET METAL WORK
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEETS (Also see Brass Mill Products, Strip Metal.)

Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., New York-Toronto, Canada.
Strahs Aluminum Co., New York.

Brass, Copper and Nickel Silver
American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Dallas Brass & Copper Co., Chicago, Ill.
New England Brass Co., Taunton, Mass.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

Bronze
Conklin, T. E., Brass & Copper Co., New York.
New England Brass Co., Taunton, Mass.

Copper
Conklin, T. E., Brass & Copper Co., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.

Muntz's Metal
Taunton-New Bedford Copper Co., Taunton, Mass.

Nickel-Silver
New England Brass Co., Taunton, Mass.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

Plated and Polished
American Nickeloid Co., Peru, Ill.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver, Sterling
Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.

Zinc
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SHERARDIZING
New Haven Sherardizing Co., Hartford, Conn.

SHERARDIZING FURNACES AND EQUIPMENT
New Haven Sherardizing Co., Hartford, Conn.

SILICON COPPER
Ajax Metal Co., Philadelphia, Pa.

Boronic
American Boron Products Co., Buffalo, N. Y.

SILVER CHLORIDE
Cooper, Chas., & Co., New York, N. Y.

SILVER SOLDER
Handy & Harman Co., New York, N. Y.

SILVER CYANIDE
Roessler & Hasslacher Chemical Co., New York.

SILVER DRIP RACKS
General Ceramics Co., New York, N. Y.

SLAB ZINC
Hegeler Zinc Co., Danville, Ill.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SLITTERS, SHEET METAL (See Shears.)

SMELTERS AND REFINERS (Also see Ingots.)
North American Smtg. & Refg. Co., Phila., Pa.

Copper-Bearing Material
Ajax Metal Co., Philadelphia, Pa.

Gold
Handy & Harman, New York.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver
Handy & Harman, New York.

SOAP AND SOAP CHIPS
International Chemical Co., Philadelphia, Pa.

SODA ASH
Buchanan, The Thos., Co., Cincinnati, Ohio.

SODIUM BICHROMATE
Mutual Chemical Co., New York, N. Y.

SODIUM CYANIDE
American Cyanamid Co., New York.
Daniels & Orben Co., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York.

SOLDER

Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Marshall Co., Los Angeles, Cal.

SOLDER MOLDS (See Molds.)

SOLDERING FLUX (See Fluxes.)

SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.

SOLUTIONS, OXIDIZING

Nickel
Sulphur Products Co., Greensburg, Pa.

SOLUTION TESTERS
State Mfg. Co., Chicago, Ill.
Wood Co., Walter S., Boston, Mass.

SOLVENTS
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Merrimac Chemical Co., Boston, Mass.
Roxalin Flexible Lacquer Co., Long Island City, N. Y.
Walker, Henry V., Co., New York.
Zapon Co., The, Stamford, Conn.
Zeller Lacquer Mfg. Co., New York.

SPECIAL MACHINERY FOR NON-FERROUS MFG.
Torrington Mfg. Co., Torrington, Conn.

SPECIALTIES, METAL (See Wire Specialties; Wire Shapers and Forms; Metal Goods Made to Order.)

SPELTER (See Slab Zinc; also see Ingots.)

SPELTER CHUCKS (See Chucks.)

SPINNING

Job & Contract

SPINNING LATHES (See also Lathes.)
Pryibil, P., Machine Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

SPRAYERS
Foundry
De Vilbiss Mfg. Co., Toledo, Ohio.
Lacquer, Enamel, Japan, Paint
DeVilbiss Mfg. Co., Toledo, Ohio.
Economy Machine Products Co., Chicago, Ill.
Nikolas & Co., G. J., Chicago, Ill.
Ideal Air Brush Mfg. Co., New York.

SPRAYING ACCESSORIES, HOODS, TABLES, ETC.
DeVilbiss Mfg. Co., Toledo, Ohio.
Ideal Air Brush Mfg. Co., New York.

SPRAYING EQUIPMENT, PORTABLE
DeVilbiss Mfg. Co., Toledo, Ohio.
Economy Machine Products Co., Chicago, Ill.
Ideal Air Brush Mfg. Co., New York.

SPRUE CUTTERS (See also Saws.)
Turner Foundry & Machine Co., Philadelphia, Pa.

STAMPING AND DRAWING, JOB AND CONTRACT (Also see Metal Goods Made to Order.)
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

STEAM SUPERHEATERS
Babcock & Wilcox Co., New York.

STEEL BALLS FOR BURNISHING BARRELS
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hartford Steel Ball Co., The, Hartford, Conn.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Smith-Richardson Co., Attleboro, Mass.

STEEL, BORONIC

STIRERS (See Graphite Products.)

STOKERS, CHAIN GRATE
Wood Waste
Allington & Curtis Co., Saginaw, Mich.
Babcock & Wilcox Co., New York.

STONEWARE, ACID-PROOF (See Acid Pumps; Dipping Baskets.)
General Ceramics Co., New York.
U. S. Stoneware Co., New York.

STRAIGHTENING, CUTTING AND FORMING MACHINERY (See Cutting, Straightening and Forming Machinery.)

STRIP METAL IN COIL AND ROLLS (Also see Brass Mill Products.)
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Brass, Copper and Nickel Silver
New England Brass Co., Taunton, Mass.

STRIP ROLLING MACHINE
Yoder, The, Co., Cleveland, Ohio.

SULPHOCYANIDE OF SODA
Roessler & Hasslacher Chemical Co., New York.
Zapon Co., The, Stamford, Conn.

SULPHUR LIQUID
Sulphur Products Co., Greensburg, Pa.

SWEEP SMELTERS (See Smelters and Refiners.)

TANK FILTER
Belke Mfg. Co., Chicago, Ill.

TANKS
Chromium
Chromium Eng. Corp. of America, New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hard Rubber
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Lead Lined
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Pickling
General Ceramics Co., New York.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
U. S. Stoneware Co., New York.
Plating
Boissier Elec. Corp., New York, N. Y.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Steel
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Stone
General Ceramics Co., New York.
U. S. Stoneware Co., New York.
Wood
Corcoran, A. J., & Co., Jersey City, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker, The, Co., Chicago, Ill.

TEMPERATURE
Foxboro Co., Foxboro, Mass.

TEMPERATURE CONTROLS
Foxboro Co., Foxboro, Mass.

TESTERS
State Mfg. Co., Boston, Mass.
Wood Co., Walter S., Boston, Mass.

TESTING LABORATORIES (See also Assayers and Chemists.)
Chemical
New York Testing Laboratories, New York.
Pitkin, Lucius, Inc., New York.

TILE REFRACTORY

TIN; PIG, BAR and BLOCK (See also Ingots, Tin.)

TINNING (See Electro-Plating, Hot Galvanizing and Tinning.)

TINNING FLUXES (See Fluxes.)

TRIPOLI COMPOSITION
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
McAleer Mfg. Co., Detroit, Mich.
Stevens, Inc., Frederic B., Detroit, Mich.

TUBE MILL MACHINERY
Torrington Mfg. Co., Torrington, Conn.

TUBES (Also see Aluminum and Brass Mill Products.)
Brass, Bronze and Copper
Aluminum Company of America, Pittsburgh, Pa.
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Seamless Brass and Copper
Penn Brass & Copper Co., Inc., Erie, Pa.

TUMBLING BARRELS (Also see Burnishing and Polishing Barrels; Plating Barrels.)
All Kinds
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Henderson Bros. Co., Waterbury, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.
Foundry
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
Japanning
Baird Machine Co., Bridgeport, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Lacquering
Baird Machine Co., Bridgeport, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.
Oblique
Baird Machine Co., Bridgeport, Conn.
Henderson Bros. Co., Waterbury, Conn.
Ideal Industrial Machinery Co., Cincinnati, Ohio.

TUNGSTEN
Metal & Thermit Corp., New York.

TURNING, CHIPS, ETC., BUYERS OF (Also see Drosses, Residues, Etc., Buyers of; Metal Dealers.)

TYPE METAL (See Ingots.)

UTENSILS
Hard Rubber
American Hard Rubber Co., New York.

VALVES AND FITTINGS
Belke Mfg. Co., Chicago, Ill.
Acid Proof
American Hard Rubber Co., New York, N. Y.
Duriron, The, Co., Inc., Dayton, Ohio.

VENTILATING SYSTEMS (See Blowers and Blow Piping; Dust Collectors and Ventilating Systems; Exhaust Fans and Heads.)
Astle, H. J., & Co., Providence, R. I.
Pangborn Corp., Hagerstown, Md.
Chromium Plating Tanks
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

VIENNA LIME COMPOSITION
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

VIBRATORS
Campbell-Hausfeld Co., Harrison, Ohio.

VOLTMETERS (Also see Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

WASHING MACHINERY
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.

WASTE CLEANER AND OIL RECLAIMER
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

WEIGHERS AND SAMPLERS
Pitkin, Lucius, Inc., New York.

WHALE OIL SOAP (Also see Cleaning Compounds; Fig Cleansers.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Philadelphia, Pa.

WHEELS, POLISHING
Advance Wheel Mfg. Co., Chicago, Ill.
Allied Industrial Products Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.

WHITE METALS (See also Smelters and Refiners; Babbitt Metal; Ingots; Etc.)
Ajax Metal Co., Philadelphia, Pa.

WHITE POLISH
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

WIRE
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., New York-Toronto, Canada.
Brass, Bronze, Copper and Nickel-Silver, Etc.
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

WIRE FORMING MACHINERY (See also Cutting, Straightening and Forming Machinery.)
Baird Machine Co., Bridgeport, Conn.

WIRE MILL EQUIPMENT
Farrel-Birmingham Co., Inc., Ansonia, Conn.

WIRE STRAIGHTENING AND CUTTING MACHINERY (See Cutting, Straightening and Forming Machinery.)
Shuster Co., The F. B., New Haven, Conn.

WIRE WHEEL BRUSHES (See Brushes.)

WIRING DEVICES (See Electrical Apparatus and Equipment.)

WOOD ENAMELS (See Enamels.)

WOOD LACQUER (See Lacquers.)

YELLOW BRASS (See Sheets, Muntz Metal.)

ZINC (See Slab Zinc; Smelters and Refined Anodes; Sheets; Strip Metal, Etc.)

ZINC CYANIDE
American Cyanamid Co., New York.
Roessler & Hasslacher Chemical Co., New York.

ZINC DUST
Grasselli Chemical Co., Cleveland, Ohio.

ZINC ELECTROLYTIC
United Metals Selling Co., New York.

ZINC PLATING (See Electro-Galvanizing.)

ZINC, ROLLED (Also see Sheets, Zinc.)
Hazel Atlas Glass Co., Wheeling, West Va.
Platt Bros. & Co., Waterbury, Conn.

ZINC SALTS, COMMERCIAL
Meaker, The, Co., Chicago, Ill.

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